APRIL 1947 Vol. 9. No 1

Editorial

OUR February Editorial was concerned with proposals which had been put forward that the ABC should accept sponsored programmes on behalf of advertisers in order to obtain extra revenue which its expanding programme apparently demands. It is clear now that the greater part of that extra revenue was required for the ABC news service, estimated, if I remember correctly, as likely to cost nearly a quarter of a million pounds annually.

The unattractive features of a National service "going commercial" were pointed out in that Editorial. We made the point, at least by implication, that the ABC was doing in many ways a good programme job as it stands, whatever other criticisms might be levelled at its organisation. Nor did we mean to imply that commercial radio as such was a bad thing. The view we take is that our present Australian system, combining the merits of both commercial and National stations, could best serve the Australian listening public by remaining as it is.

At the same time, we discussed the possible implications behind this proposal, added to many other straws which the wind has blown during the last few years, that the independent nature of the ABC was in danger. Maybe because of our peculiar interest in our radio world, we are a bit more sensitive to these things than are others whose everyday life doesn't link up so closely with it.

The latest suggestion that the Government should appoint a Minister to guide the destinies of the ABC under the title of "Radio Australia," brings many of these ideas of ours into the open. What a change in policy since the days when the Commission was first brought into being specifically to preserve the unbiased integrity of our National service, no matter what political opinion found itself in office.

In the Editorial referred to we said that the situation had "all the possibilities of the biggest propaganda monopoly this country has ever seen." With the entire network directly under the dictates of the Government, could any assessment have been more complete?

I have every reason to believe that the project will go through, and can even make a guess at some of the personnel who will be responsible for its administration. If this guess is correct, it will mean an internal upheaval in the ABC which will shake it from top to bottom.

Once again, the public are entitled to ask a few questions. What are the Government's ideas about the remainder of Australian broadcasters, the commercial stations? Are they to share in this new scheme or not? Is there to be any loophole left for independent expression on the air? Or will the propaganda monopoly swallow the lot?

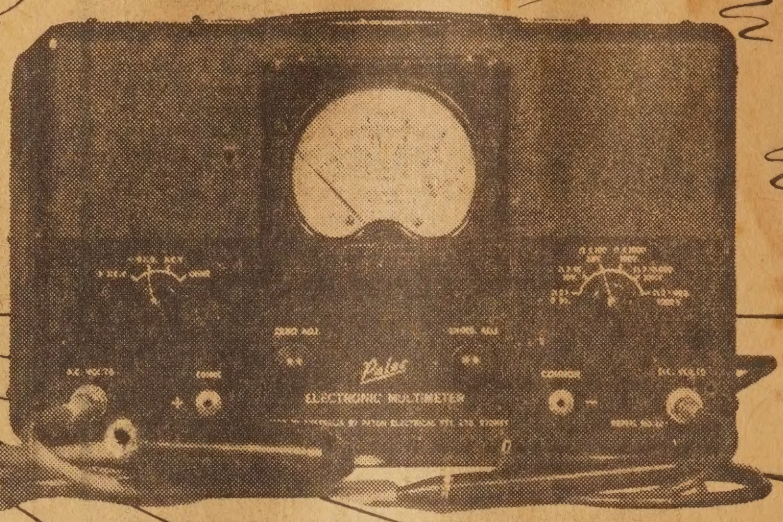
This journal has no political views or colors. I am interested at the moment merely in the dangerous principle that broadcasting shall echo the ideas of the Government in power, whether it be Labor or Liberal. Is this the kind of broadcasting the people want? Or with typical Australian nonchalance, will they shrug their shoulders and take what is given to them?

John Moyle

INDEX

EDITOR: JOHN MOYLE, M.I.R.E. (VK2JU) TECHNICAL EDITOR: NEVILLE WILLIAMS, A.M.I.R.E. (VK2XV)

NEW! *Quick trouble tracing right to the spot—*



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The practical effectiveness of this new instrument in handling service problems will make it the hardest worked and most popular of all test units. In conjunction with our Model M.O. Oscillator it reduces servicing to a simple technique. It will check and trace the signal from channel to channel and from stage to stage—R.F., I.F. and audio sections. Speeds the location of obscure, intermittent, noisy, open and short circuits. Checks condensers, coils, transformers, resistors, valves, speakers, high resistance leaks and faulty insulation.

The instrument comprises:—

(1) R.F.-A.F., six-range voltmeter: 0-2.5-10-25-100-250-1,000 volts A.C. Fitted with polystyrene bushed probe operating on frequencies up to 300 M.C., accuracy ±0.5 db to 100 M.C. Input cap. 10 uuf, loading equal to 6 megohms.

(2) High resistance D.C. six-range voltmeter: 0-2.5-10-25-100-250-1,000 volts D.C. Total load 11 megohms—giving over 4 megohms per volt on lowest range.

(3) Ohmmeter, six-range—from 0.5 ohms. to 1,000 megohms.

OPERATION.

The instrument is A.C. operated, 200-260 V., employing 4 valves, simple to operate and independent of line fluctuations. Zero setting common on respective ranges. Large 5-inch meter with two-coloured scale. Housing, standard steel case, 14 x 8¾ x 6½. Weight, 15¾ lbs. Supplied with detachable co-axial leads and 20-page instruction book on the instrument and its uses. External vibrator unit for battery operation available as an extra.

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P.13.FP

YOUR PRIVATE RADIO TRANSMITTER?

SOME day we may carry our telephones about with us. This attractive citizen of USA demonstrates a new, lightweight, individual, two-way radio that can be used for rural communication, for district salesmen, construction projects, and countless other instances where wiring for telephones is not convenient. It is said the Citizen's Radio, as it is called, will have an approximate range of seven miles, and that it will allow several points of contact. The model here is executed in leather, metal and plastics, and is carried on a shoulder strap in the manner of a binocular case or small camera. But don't rush your radio store! You can't buy one, and wouldn't be licenced for it if you could.

Remember?

The price exacted from this country by bushfires in loss of property and lives is a terrible one. I use the word "price" because so much of it is paid through our own neglect and lack of preparedness. We shall probably never prevent bushfires altogether, but we can reduce them by using care and commonsense. We must reduce their damage by employing every modern aid in fighting and controlling them.

MY interest in the matter is rather keen at the moment, as the result of a recent visit paid to the interior of NSW representing the Bush Fires Advisory Committee at a demonstration of radio communications for fire-fighting.

This committee, operating within the Chief Secretary's Department, is working to introduce and co-ordinate the use of radio, in addition, of course, to its many other activities connected with bushfires.

In this, it has enlisted the aid of the Wireless Institute of Australia, which, in addition to technical advice, is endeavoring to interest country amateur transmitters in the task of operating and maintaining the radio equipment as it is acquired.

My visit, therefore, as a WIA representative on the committee, was made with the intention of observing first-hand how radio could best be used, and of obtaining the views of local fire brigade members and shire councillors concerning their own particular problems.

The setting-up of a satisfactory radio network for fire-fighting is quite a task. Firstly, there is the problem of setting down a general basis of operation, which, in part or in full, will meet the needs of local geography, and at the same time maintain a common basis to allow several shires if necessary to work together with a common method of procedure.. This calls for standardisation of equipment, careful selection of frequencies and standardisation of training and maintenance. The aim should be to provide a national emergency network, capable of operating as units within local shires, or of being co-ordinated on a big scale should the emergency be large enough to warrant it.

This, in turn, presupposes suitable equipment being available in large quantities, operated under a Government subsidised and controlled plan, which will embrace any and every section of the community able to play its part. It even includes air support in those areas where large-scale fires are likely to occur.

Such a plan eventually must come about. Until it does, those charged with the responsibility of fire-fighting must do what they can to interest all concerned, to educate them to become radio-minded, and to get started by using what equipment is available.

In Victoria and NSW, at least, the WIA in conjunction with the author-

ities in each State is making a start. There is a big difference between the fire-fighting organisation in these two States, and as a result the method of operation is, for the time at least, somewhat different. At the moment, I am concerned with the set-up in NSW, although, as I have said, the problem must be tackled sooner or later on a national basis.

GENERAL PLAN

Although each shire is subject to different types of fires, it is becoming obvious that the same general plan can operate in each case, stress being laid on one or more sections of it by each shire to meet its individual requirements.

In the case of small fires, things happen so quickly, and the area is so restricted, that communication other than by word of mouth is in many cases impracticable. But little fires always start the big ones, and when the outbreak becomes more than a few men in a paddock can control, the shire as a whole becomes interested, and organised fighting comes into action. In such cases, communication both rapid and flexible must be ready and waiting.

The first requirement, therefore, is a radio link between the officer who is controlling the operations, and the parties which set out to execute them. In most cases, these parties set out in cars and trucks, splitting up into smaller units, according to the extent and nature of the fire.

The brigade captain wants communication to each of these main parties, and also to the local shire offices, or maybe the broadcasting station, which, if required, can issue general warnings and other appropriate messages on the ordinary broadcast-band frequency.

WALKIE-TALKIE SETS

In addition to the two links in the chain, there may be many occasions when the close support of walkie-talkies or similar portable equipment will be required to communicate with the leader of each small party, who, in turn, can relay messages back to the officer in control as appropriate.

Using their general scheme as a basis, almost any type of outbreak can be controlled in a manner not possible by any other means.

It is true that many shires are well covered by telephone which, in any case, would probably be used to report the initial outbreak. But, apart from the fact that telephones are slow and operate from fixed positions generally remote from the scene of operations, the fire itself frequently brings down the wires and isolates the areas concerned. The use of runners is applicable only to operations on a very small scale.

The NSW Advisory Committee has obtained a number of Army 109 equipments which are capable of being operated from a car or truck, and which will be available to shires at a maximum cost of £15 each. The demonstration I attended was to show how these sets can be used between the control point and large parties.

An Army walkie-talkie set being used during bushfire fighting in Victoria. This type of set is useful for close support where short distances are involved.

Although it would be possible to visualise more efficient and otherwise suitable equipment, this set has shown itself capable of maintaining clear communication with the major control over distances up to 25 miles, and between car and car of about 15 miles.

ACTUAL RESULTS

This particular demonstration gave car-to-car service over a heavily-wooded range of about 12 miles with the greatest of ease. In many areas these figures would be greatly exceeded —in very bad spots they might be regarded as maximum. Operation is simple, and the results quoted above are for voice operation Using a Morse key, distances might well be doubled.

At the moment, walkie-talkie sets are not available comparable with the absurdly low price given for the 109, but eventually, particularly as the shires become alive to the possibilities of radio, some satisfactory basis of supply will undoubtedly be forthcoming.

The first step, however, is to interest the shires themselves in the scheme, and to encourage them to use what equipment is available to supplement their present methods, and to train their personnel in the use of radio generally.

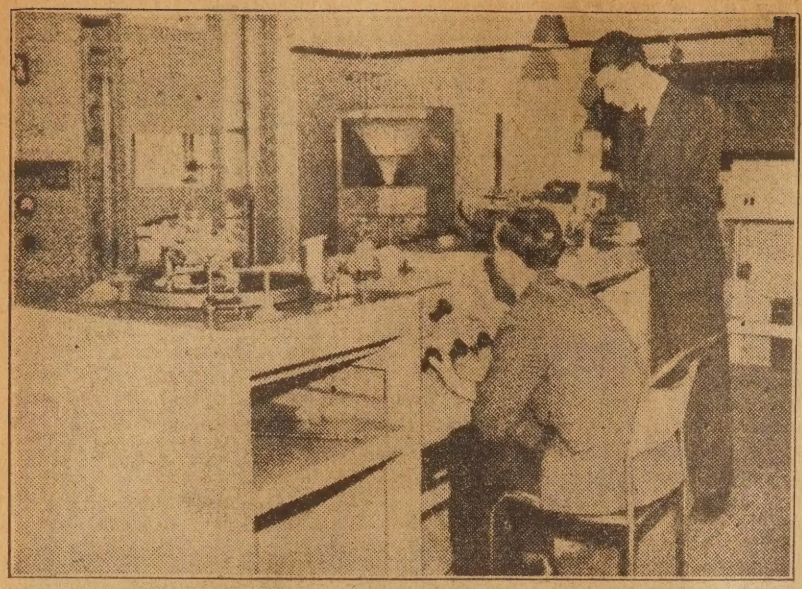
There is of course a tendency to discount fire-fighting organisation in periods where fires have fortunately been few and far between. Actually, such periods are ideal in which to prepare for the day when the danger is upon us. The damage which a bad fire can cause makes the cost of equipment which could have controlled it a mere pittance by comparison.

OTHER EMERGENCIES

It must be remembered, too, that fires bring emergencies apart from actual fighting. There will be casualties which must be cleared if lives are to be saved. Over a period of days, urgent supplies will be required. In all these things, the saving of minutes and manpower might well be critical factors. Only radio can provide communication of the type which is absolutely essential.

At the moment, the plan is only in its infancy. A mere half-dozen demonstrations have been arranged. But there will be many others, the success of which depends on the interest and initiative of those who carry them out, and of those who witness them.

by John Moyle



A recording machine of the BBC Transcription Service. The discs are sent to your broadcasting station where you hear them on your own wavelength at your most convenient time.

The B.B.C. makes transcriptions for you!

Everyone has listened to the BBC's recorded programmes which have been featured over the ABC for many years. In this article, Richard Bright tells the story of the Service and its activities.

A SHORT while ago, a department of the BBC that has quite a lot to do with broadcast programmes changed its name. The "London Transcription Service of the BBC" became the "BBC Transcription Service"—a tidier title for a service to broadcasting stations all over the world that did important work during the war and will have an increasingly important job to do in the years ahead.

It may help if I tell you quite briefly what transcriptions are, and why they came into being. A BBC transcription is a BBC Programme, recorded, under the best possible conditions, on discs that can be sent overseas and re-broadcast from local stations. To realise the usefulness of this service, you have only to think of the normal conditions under which you listen to the BBC.

First, you can hear it direct if you have a short-wave set. The advantage of this, of course, is that you get the programme "live," but our old enemy atmospheric conditions sometimes spoils the effect. Secondly, your local station can take a hand by re-broadcasting the programme on your own wave simultaneously with the BBC transcription, or by recording it for broadcasting at a more convenient time in its schedule. This overcomes the difficulites of wavelength and time, but you are still at the mercy of atmospheric conditions.

BBC TRANSCRIPTIONS

So, we come to the third method—BBC transcriptions. In this case the programme goes on to discs in London under ideal recording conditions, and the discs are sent to your broadcasting station, from which you hear them on your own wavelength at your most convenient listening time.

Before I go any further, just a word about the discs themselves. They look like ordinary commercial gramophone records, but are much lighter (so that it is economical to send them by air) and they are practically unbreakable. Their reproduction quality is the best obtainable (the Transcription Service experts are quite merciless in throwing out any recordings that do not measure up to their high standards), and finally they are played in the same way as ordinary commercial discs, so that even inexperienced operators can use them successfully.

by Richard Bright

EARLY HISTORY

An organisation with the title of the Joint Broadcasting Committee was formed early in 1939 under the auspices of the Foreign Office. Its object was to extend the knowledge of Britain and British life in countries abroad, and it did this by means of specially prepared radio programmes, sent out either by direct telephone relay, by script or on discs.

Shortly after the outbreak of war, the JBC was taken over by the Ministry of Information, and as it became obvious that recording was going to play a very big part in the job, the JBC started its own recording section. By the middle of 1941, the Recorded Programmes Section of the JBC had grown considerably, and in July of that year the broadcasting demands were such that it was decided that it could best operate and expand within the BBC.

Accordingly, the JBC, as such, ceased to exist and became the London Transcription Service—a part of the Overseas Division of the BBC. And it was natural that the newly-formed LTS should absorb the Empire Transcription Scheme, a somewhat analogous organisation already within the BBC, which served the Dominions and Colonies.

Throughout the war years, much of the output was devoted to giving the world a sound picture of life in Britain, from the lurid high-lights of the blitz to the quiet undertones of the British countryside. At the same time, transcriptions of the BBC entertainment programmes were going overseas. Those in English were mostly programmes heard by Home listeners, while programmes of entertainment in foreign languages were specially produced and recorded.

And now the Transcription Service is settling down to its peace-time job. This falls into two parts—programmes in English and programmes in foreign language. It would be an obvious waste of time and effort for the Transcription Service to enter the field of topical events. The ordinary overseas services are the medium for them.

It does, however, make its own recordings of them so that the material can be used for building sound-pictures made from the non-topical angle and issued later on their own merit.

And now for the type of programmes that you, as listeners to the English service, can look forward to in the months to come. They will represent a good cross-section of what the Home listeners hear, bearing in mind your special needs and tastes. The purely domestic programme with a number of local allusions, for example, would not make good transcription material, except in rare cases. The current British joke or catch phrase that would get a roar of laughter from a British audience listening to the actual show would be meaningless to, say, New Zealand listeners hearing it on Transcription. They would probably miss the point of the joke. And in any case it might no longer be topical by the time they heard it.

MUSIC

So we have to go for programme material that will appeal more to a scattered audience, and will also be acceptable over a long period of time. Apart from that limiting factor, you will hear a representative selection from what the Home listener has been hearing.

Music, for example. You can have the widest range, from concerts by the BBC Symphony Orchestra, through light music of the type played by George Melachrino and his Orchestra to the newest dance tunes. Many of these programmes are recorded from the original broadcasts in Home or Overseas Services; others are specially arranged for the Transcription Service.

In drama and features you have a wide choice. Lovers of serious drama can look forward to hearing some of the plays from the "World Theatre" series. This series, which includes works by the great dramatists of ancient and modern times, was hailed as a considerable radio event when the plays were first broadcast from London. Many of the lighter plays in the Home and Overseas services also find their way into the transcription list.

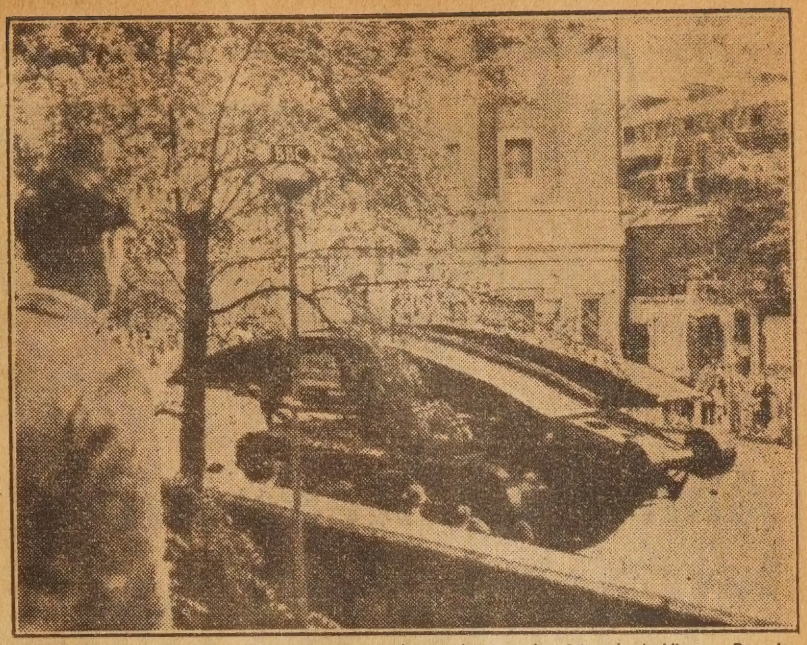
Serials, too, make ideal transcription material. You remember Francis Durbridge's "Paul Temple" stories? "A Case for Paul Temple," the latest of them, is now on record, and it is very likely that you will be hearing it from your own station before long. Look out, too, for "The Three Musketeers," "Jane Eyre" and "Dombey and Son." The Transcription Service is taking them all, and they will probably come your way.

The best of the feature programmes are taken, too. Perhaps you remember shows of the quality of "Radar," or the fascinating semi-scientific programmes by Nesta Pain. And look out for the authentic and thrilling series, "Scotland Yard at Work."

Variety has its full share of transcriptions. ITMA is always sure of a big welcome, and several of the other new series are now making their recorded appearance—Charlie Chester and his happy gang in "Stand Easy" (you may remember Charlie in his wartime shows), and "All Hale," featuring Binnie and Sonnie Hale, are among the recent arrivals. Bear in mind, though, that only those programmes that do not depend for their point upon immediate topicality or very localised humor get through the carefully selective net.

Talks and discussions are covered from all angles. The "Brains Trust" is a hardy annual. Series like "The Written Word" cater for the literary-minded; "Science Notebook" has its appeal for lay as well as expert listeners. In fact, whatever your tastes, there are almost certain to be transcription talks to interest you.

That is a brief sketch of what the English section of the Transcription Service is doing. But it is only half the picture. Programmes for non-English listeners are recorded in 19 languages. They have a particularly big following in Latin America, and their circulation in the European countries is being rapidly expanded. Many of them are taken from the BBC's regular foreign language services, but a high proportion are specially produced for transcription purposes..

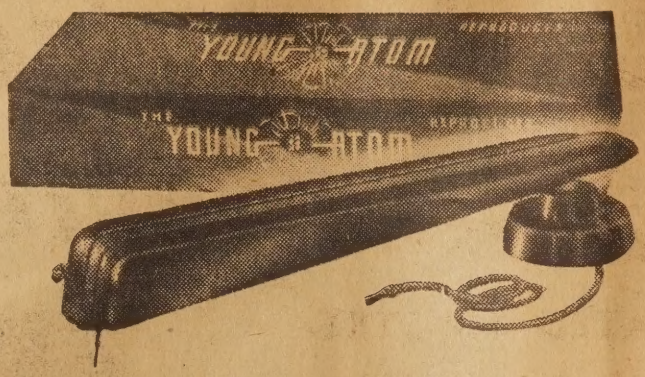


A BBC Transcription Service microphone picks up the sounds of London's Victory Parade.

The producer of a transcription play discusses the programme with the cast.

INSTRUCTION

A particularly interesting development here is the teaching of English by radio, the lessons being given additional point by describing the home life of a typical English family. Latin-American listeners learn English, for example, by listening to the day-to-day doings of "The Baker Family," with comments in their own language by an instructor, and find that the little incidents and humors of this typical doctor's household cloak a series of progressive lessons that quickly implant a working knowledge of colloquial English, and, in addition, an insight into what might be called the British way of life.



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- Response with 3 D.B. or over Normal Frequency Range.
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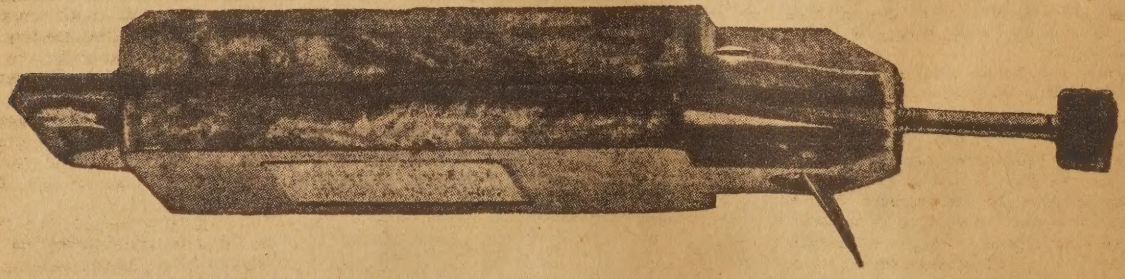

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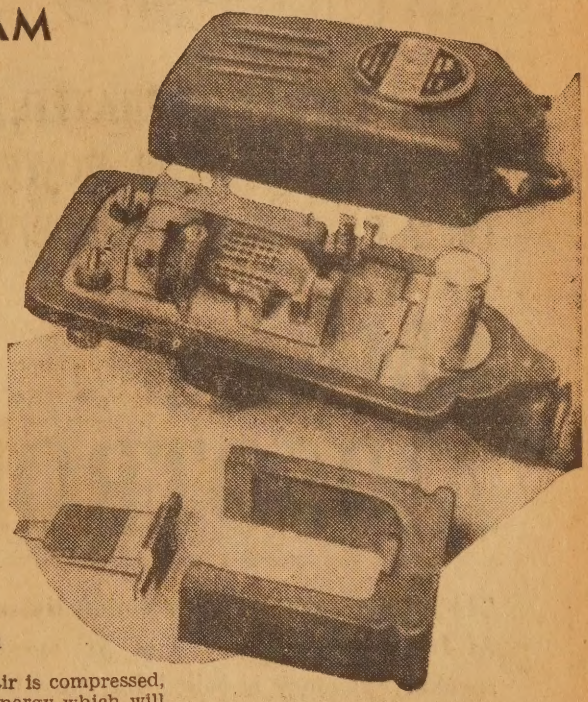
Technical Review

MODULATED AIR-STREAM

NOVEL P.A. SYSTEM

In a novel PA system developed by the US Army Signal Corps, the conventional loudspeaker is replaced by one in which a jet of air emerging under pressure is modulated by a valve mechanism operating at an audio frequency.



PUBLIC address equipment filled many important roles during the war, for troop movements, invasion, propaganda, training and entertainment.

At the outbreak of war, commercial sound amplification equipment was pressed into immediate service.

To obtain a high output of audio power, particularly out-of-doors, it is necessary to use a large number of loudspeaker horns requiring, in turn, heavy duty multi-stage amplifiers, a source of considerable operating power, and weighty equipment.

Because of the output requirements and the military necessity of portability and light weight, a different type of sound amplification became an immediate war requirement.

The problem was attacked by the Signal Corps Engineering Laboratories working with sound engineers of Dilks, Incorporated. Exhaustive experimentation eventually led to the development of an entirely different method of sound amplification; the modulated air-stream.

The new equipment has a remarkably low weight-to-output ratio. This is demonstrated by comparison with a typical 300-watt amplifying system. The older equipment weighs about 750 pounds; the air-stream-modulation system weighs only about 80 pounds. This tremendous saving in weight is obtained with no reduction in range or intelligibility.

There are four principal components of the new air-stream-modulation equipment; the power unit, a 2-stage audio amplifier, a modulating valve assembly, and a conventional loudspeaker horn.

The power unit consists of a gasoline engine which drives a 250-watt, 500-volt dc generator and a rotary-type air compressor. The air compressor develops approximately 10lb. per square inch pressure with a volume of 10 cubic feet per min.

The audio amplifier is designed to deliver 15 watts of audio power with not more than 10 per cent. harmonic distortion at 1000 cps.

The mechanism for converting the amplified electrical waves to audio or sound waves is the modulating valve, the heart of the air-stream modulation system, by which compressed air is modulated.

When a volume of air is compressed, it contains potential energy which will escape whenever expansion or release is permitted. Discounting any inherent resonant effects of the volume, if the air is allowed to escape in a continuous flow, there will be no generation of audio waves. However, if the stream of air is modulated at a rate within the audible range, sound or audio frequencies will be generated.

The modulation valve consists of two slotted grids, one of which is the armature and is actuated by the solenoid to produce the variations in air pressure according to the amplified speech signals. The slots in both grids are .003 inches wide, separated by intervening bars or reeds .015 inches wide.

The armature or modulating grid is controlled magnetically and moves alternately nearer to grid and farther from the slot openings in the fixed grid.

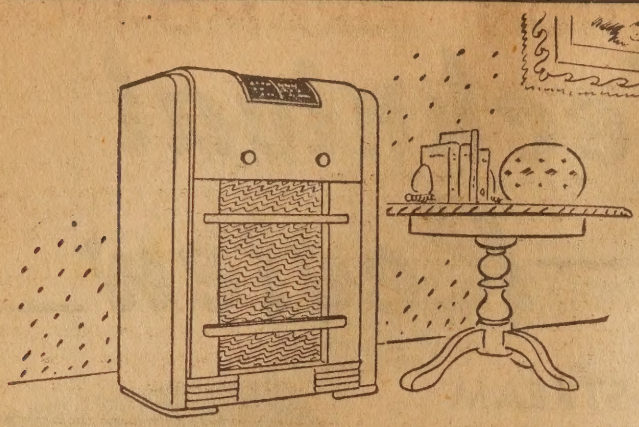
When the valve is closed, the reeds of the modulating vane cover the slits in the fixed grid, and there is no passage of air through the modulation valve.

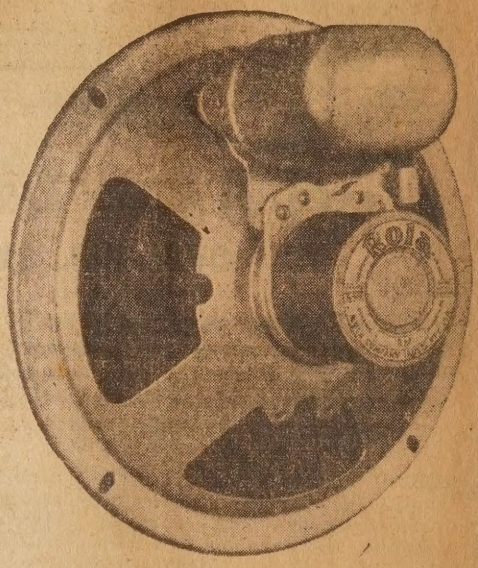
Maximum movement of the modulating vane is .0006 inches, and passage of the compressed air through these grids causes the air stream to be modulated, according to the slot openings.

Used with a conventional loudspeaker horn, 10 inches in diameter and about 18 inches long, sound is projected into space, under normal conditions with a 95 per cent. intelligibility or better at distances from two to three miles along the axis of projection.

Maximum undistorted acoustic power output, measured on an axis at 30 feet, is approximately 114 db. above .0002 dynes per square cm.

"Raise the aerial a little higher, Gus!"





FOR BATTERY OPERATED, A.C.-D.C., VIBRATOR POWERED OR A.C. OPERATED RECEIVERS

8M WITH ANISOTROPIC ALNICO

The ROLA 8M Speaker is eminently suited for incorporation in battery operated, AC-DC, Vibrator Powered or AC operated receivers. Wherever higher than normal speaker efficiency is called for the ROLA 8M is the speaker to use.

Here are the facts:—

The ROLA 8M is energised by a generously sized magnet of Anisotropic Alnico.

Efficiency of the ROLA 8M is appreciably higher than Standard 8" speakers.

Fitted with ROLA isocore (Type C) transformer, the ROLA 8M ensures against failure due to electrolysis in battery operated receivers.

Specifications:—

Weight (Speaker & Transformer) 2.87lbs.

Diameter of cone housing 8.1-16"

Distance front to back 3.15-16" (approx.).

Voice Coil impedance 2 ohms.

Limited supplies will shortly be reaching Rola Speaker Distributors.

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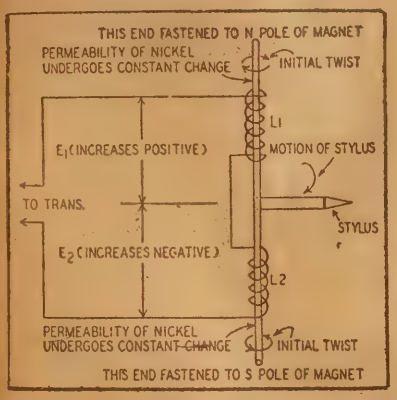
MAGNETOSTRICTION GRAMO-PICKUP

A gramophone pickup recently announced, works on the novel principle of torsional magnetostriction—the variation of the magnetic properties of a wire when subjected to mechanical stress.

MAGNETOSTRICTION is that property of certain ferromagnetic metals such as nickel, iron, cobalt and manganese alloys which cause them to shrink or expand when placed in a magnetic field.

Conversely, if subjected to compression or tension the magnetic reluctance changes, thus making it possible for a magnetostrictive wire or rod to vary a magnetic field in which it may be placed. This is true for lateral as well as longitudinal strains.

If the ends of a ferromagnetic wire are fixed and a twisting motion applied to the centre, in either direction, the twist will be equal on both sides. This may be demonstrated by holding a strip of paper, about one inch wide by 12 inches long, by the ends. Have some-



one grasp the strip at the middle and twist gently in each direction. Note that the amount of twist on either side of centre is equal and increases as the angle of rotation is increased.

If the same strip is first twisted 90 degrees, and the ends secured, a twisting motion at the centre will increase the amount of torsion in one half the strip and reduce it in the other.

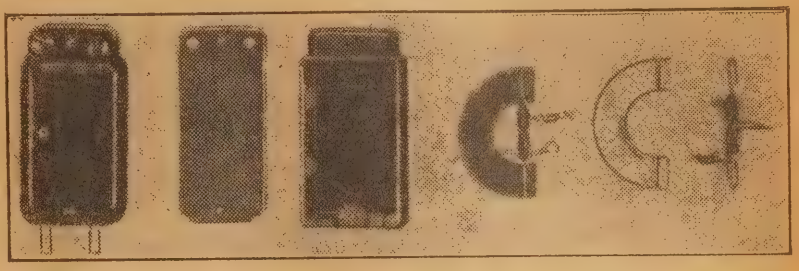
One half the strip will be twisted still farther than 90 degrees, while the other will tend to return to its straight state. The wire used in the magnetostriction pickup is similarly twisted through 90 degrees, the ends looped and the wire secured in a magnetic field.

A practical pickup is shown above in exploded form. A permanent reproducing stylus is fastened securely at right angles to the centre of a piece of nickel or other magnetostriction wire.

Two pickup coils, each wound with 100 turns of fine wire, are placed over the magnetostrictive wire on each side of the stylus. The ends are then looped over themselves and the wire given a slight twist and fixed between the poles of a horseshoe magnet.

With the twisted wire in place, any motion of the stylus will cause the halves of the wire to twist in the same direction, but the previous 90 degrees twist will cause the torsion on one half of the wire to increase as that on the other half decreases.

This twisting and untwisting motion in the halves of the wire will increase the leakage flux factor around one coil and reduce it around the other. It is this varying magnetic field that causes voltage to be generated in the pickup coils.



Since the change in flux is opposite in each half of the wire it is necessary to connect the coils in what would normally be series-oppos. .g. With the coils so connected the output voltage is the sum of the voltage in each coil. This connection also makes it possible to take full advantage of the even-harmonic cancellation characteristics of push-pull operation. This effect is shown graphically.

The TM pickup has an impedance of 4 ohms and is capable of generating .086 volt across a 100,000-ohm load. It is capable of reproducing frequencies up to 26,000 cycles.

The pickup coils are so small they are not affected by magnetic fields that may exist around a phonograph motor or associated power lines. This factor reduces pickup hum to a negligible degree. The pressure on the needle point is only 0.7 ounce.

The TM pickup has a low output impedance, making it necessary to employ a coupling transformer between the pickup and the grid circuit of the amplifier.

PYLON ANTENNA FOR F.M.

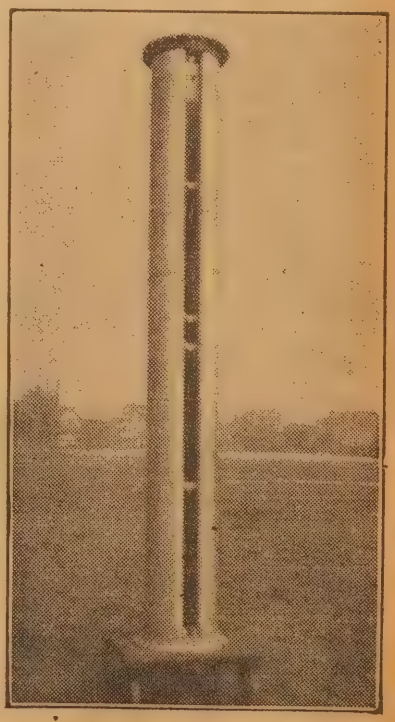
REVOLUTIONARY in its simplicity and design, a new cylindrical antenna developed by RCA gives higher gain, height for height, than any other type so far developed.

Known as the "Pylon" antenna, the new FM radiator is a mechanically rigid single element structure which is entirely self supporting. Guy wires are unnecessary and there is a notable absence of arms or circular elements. The antenna is simply bolted direct to the frame of the building by means of its bottom flange.

The antenna is likewise flanged at the top so that other sections can be bolted to it where especially high gain is needed. Stacking four sections of the Pylon results in a power gain of six, and the antenna will operate efficiently anywhere on the FM band without tuning adjustments.

The cylinder is 13ft. high and 19 inches in diameter, with a narrow slot cut from top to bottom. The metal shell itself is the radiator and the single transmission line feed runs up inside the cylinder along the slot. Rolled from a single sheet, each section weighs 350lb.

Only one feed point per section is required and interconnection between sections is possible on the ground. For a four-section antenna only two line connections are required, contrasted to as many as 10 to 50 connections for other types.



Rainmakers of Yesterday

The experiments now being carried out in Australia by the CSIR in the making of rain may yet prove of vital importance to this country, which depends so much on rainfall rather than on water conservation.

IT is, of course, pointed out by the authorities that it is far too early to predict anything of an outstanding nature, but even if nothing more comes of it, the experiment will have gained the honor of being the first successful attempt to extract moisture from clouds.

There have been many attempts to entice rain from clouds. In fact, the idea seems to have flourished right from early times that rain could be produced by the mystical powers held by witches and other people who had contact with the "supernatural."

There is no doubt that some of the attempts by these people were "successful" and the reason for this is not hard to find.

EARLY PROPHETS

During man's span of life it was inevitable that keen observers among the early people became somewhat wise regarding natural signs of weather changes and thus became what is tantamount to weather prophets. These "prophets" were highly respected, and those who were less observant, and the ignorant, really thought that this knowledge was gained through magical powers.

Having gained the respect of his neighbors—mainly because of his supposed ability to produce rain rather than his knowledge—it was an easy matter for the "magician" to further his interests by waiting for the right moment. His system was one of playing for time. He was never required to produce rain where rain was not accustomed to fall because no one lived in such places. On the other hand, appeals were made only when rain was long overdue—when it was expected, but did not come. Therefore, by ordinary logic, any time after rain was expected was the time when it was most likely to fall, and this was the time to get on with the mumbo jumbo.

RAIN MAKERS

Now these "rain-makers" were fairly well up in knowledge of local conditions, and knew that after long periods without rain in places where rain was a well-known phenomenon, it was bound to fall sooner or later. All he had to do was play for time, and what better method of playing for time than to carry out a long, solemn ceremonial which, in addition to achieving his object, inspired awe and respect from the superstitious inhabitants?

The methods mainly employed were the beating of drums, dancing and so on. It was believed that if the "operator" could imitate the sound of thunder and rain, rain would fall, and it was inevitable that if this hocus pokus was carried out long enough, rain would come. The magician got all the credit, for who would dare say that rain would have fallen if the magician had not been on hand?

This kind of magician was a "good" one. But there were also the "baddies" who produced hailstorms, floods and droughts. These baddies were in the pay of evil spirits and great pains were taken to get rid of them with incantations, blood sacrifices and the like. It must have been an anxious time for the goodies when they were praying for rain, for their reputations were suspended by slender threads. If they produced a reasonable amount of rain they were good-o, but if a flood came, well!

It is a common sight to see fountains in public parks consisting of lions with water spouting from their mouths. These had their origin in Egypt, where the people depended on the waters of the Nile for the fertility

of the land. Every year in July, the Nile overflowed and inundated the land. This was the period when the sun was in the constellation of Leo the Lion. In order that Leo would be generous with the water from the Nile, the Egyptians resorted to a bit of flattery to that luminary, and erected fountains in the form of lions' heads.

Weather changes have intrigued man for centuries, but no method has yet been devised to make weather to suit ourselves. Perhaps it is just as well, for we would have a wonderful mixture. Rain on the road, but not in the park where the cricket match is in progress. Cool weather for the six o'clockers and hot weather for the 10 o'clockers.

OLD-TIME JINGLES

Until the invention of meteorological instruments, mankind merely groped for his weather information and based his forecasts on his knowledge of his own locality. This gave rise to many queer sayings about the weather, and to many queer but erroneous beliefs. Practically everything was brought into the weather picture. The moon and sun were responsible for certain conditions according to their appearance and position. There was the new moon and full moon, the low moon and high moon, red moon and pale moon. The moon with its horns turned up or down or sideways.

Thunder was coming when a meteor fell. The flight of birds, the noise of crickets, the speed of ants, the clearness of sounds, the color of the sky, the pains in one's corns and the color of the old man's nose. All these among a thousand or so more items had a bearing on the weather.

Most of us remember some of the old sayings in the forms of rhymes or proverbs, such as:

"Evening red and morning grey
Help the traveller on his way;
Evening grey and morning red
Bring down rain upon his head."

For those who worried about the weekend weather, there was this one:

"If on Friday it rain
'Twill on Sunday again;
If Friday be clear,
Have for Sunday no fear."

Then there were the signs and portents in flowers and vegetables, such as:

"Pimpernel, pimpernel, tell me true
Whether the weather be fine or no."

Our own Mr. Inigo Jones had an antecedent as a long-range weather forecaster in the common old onion:

"Onion's skin very thin,
Mild winter coming in;
Onion's skin thick and tough,
Coming winter cold and rough."

Bees come into the picture:

"If bees stay at home,
Rain will soon come;
If they fly away
Fine will be the day."

If one preferred the hours of the day for his forecast, then:

"Between the hours of ten and two
Will show you what the day will do.
Rain at seven, fine at eleven;
Rain at eight, not fine until late."

Regarding the months of the year, thunder in January meant snow in May. "One would rather see a wolf in

by Calvin Walters

February than a peasant in his shirt sleeves," meaning that a hot February was a bad sign. "When it rains in February all the year suffers." March was supposed to be a bad omen if it started with anything but winter and ended with anything but a promise of spring. For April we have "When April blows its horn, it's good for hay and corn." "A dry May brings nothing gay."

And so man just used his wits regarding the weather for many centuries before the advent of scientific instruments.

The first organised study of the weather was made by Aristotle in the fourth century BC. He covered every phase of climate and weather known at that time and wrote a book or books called Meteorologica, from which we have derived the term denoting the science today.

FIRST STUDIES

The real beginnings of weather study as an organised science commenced with Galileo, who was born nearly 19 centuries after Aristotle in AD 1564. In addition to the study of the pendulum and the resultant Law of the Pendulum, Galileo invented the thermometer.

It was rather a crude instrument, as might be expected, and consisted of a bulb with a long-necked projection. The bulb was filled with water and heating or cooling it caused the water to rise and fall in the projection, which was marked at intervals.

Over 100 years later Gabriel Daniel Fahrenheit, of Danzig, put mercury in the thermometer and invented a scale of temperature which is known today by his name, Fahrenheit. Seventeen years later Ferchalt de Reaumum used alcohol in the thermometer instead of mercury and made a new scale of heat measurement known by his name, and in which the boiling point of water is 80 degrees and freezing point zero. Fahrenheit's scale gave the boiling point of water as 212 degrees and freezing point 32 degrees using mercury.

A few years after Reaumur, a Swedish astronomer again used mercury in the thermometer, but the scale between freezing and boiling point was exactly divided into 100 parts, with freezing at zero and boiling point at 100 degrees. These three thermometers are in constant use today.

The next most important weather instrument, the barometer, was invented in 1643 by a pupil of Galileo, Evangelista Torricelli. This invention gave a tremendous impetus to weather study, for with its use it was proved that the air pressure altered with height and other conditions, and that these pressures varied according to weather conditions.

THE BAROMETER

Some scientists thought erroneously that the barometer could be used alone for weather forecasting, and 25 years after its invention an English scientist, Robert Hooke, devised a barometer on the face of which was inscribed a forecast for various pressure readings.

These persist on the faces of household barometers to this day, mainly as a custom. They serve no useful purpose as it is the rise and fall of the barometer over a given period that

Yes sir! It's raining cats and dogs. But when the weather bureau collects the data assembled by the automatic apparatus in this kiosk, they will know much more about wind velocity, temperature, humidity, etc. which made the day what it was.

must be taken into account rather than the point at which the hand rests. However, we must have our traditions and customs, which in this case makes the barometer an "instrument which tells you when it is raining," as the Irishman said.

No weather forecast can be accurate without taking into account the direction and speed of the wind. For this we have the wind vane, which was known to the early Chinese. This shows us which direction the wind comes from. For measuring the speed of wind, an instrument known as the anemometer is used. The word is taken from the Greek and means wind-measure.

There is in use today a numeral code to indicate wind velocity. This is known as the Beaufort scale and was invented in 1806 by Sir Francis Beaufort, a rear-admiral of the British Navy. The code divides all winds into 12 groups as follows:

Beaufort number.		Velocity (miles per hour)
0	Calm	0
1	Light air	2
2	Slight breeze	5½
3	Gentle breeze	10
4	Moderate breeze	15
5	Fresh breeze	21
6	Strong breeze	27½
7	Moderate gale	35
8	Gale	42
9	Strong gale	50½
10	Whole gale	59
11	Storm	68
12	Hurricane	77½

There are several types of anemometers in use, but probably the most common is one known as the Robinson anemometer, which consists of cups attached to cross arms. The wind, by pressure on the inside of the cups, rotates the cross arms and the velocity is measured on a gauge which looks like the speedometer of a motor car.

Advances in the construction of most of the instruments make them self-recording by means of pens which come in contact with a chart. The charts are attached to revolving drums, which make a complete revolution in a given time. The various readings can thus be read for any time directly from the chart. This obviates the necessity of having observers on the spot all the time.

The formation of clouds are, of course, of the greatest importance to the weather man. The first systematic classification of clouds was made in 1803 by a London businessman, Luke Howard. He divided clouds into four classes or types: Cirrus, the highest clouds of all, consisting of ice crystals; Stratus, a very low cloud covering the whole sky; Cumulus, a beautiful formation like a woolpack; and Nimbus, the rain cloud. This classification was accepted all over the world, but was found to be insufficient for accurate use. There were all sorts of "in-between" clouds which required identification. In 1891 the Munich International Meteorological Conference prepared a cloud atlas based on Howard's classification. Revised in 1910 and again in 1930, this atlas is now the standard reference for cloud formations.

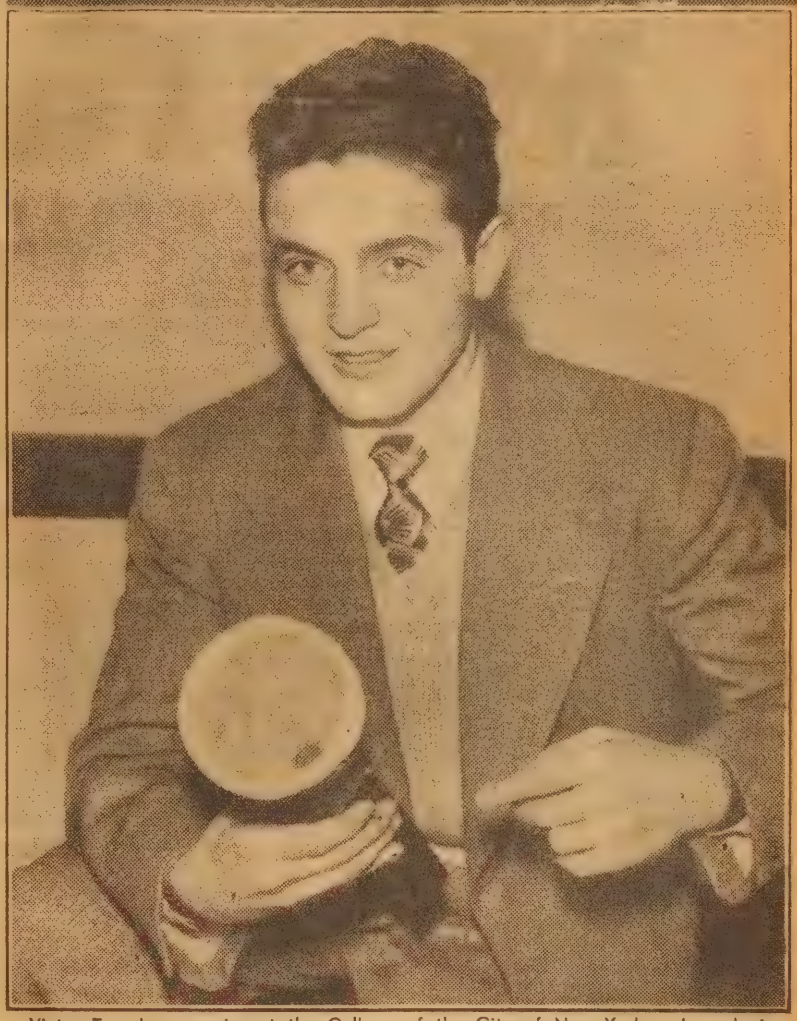
With the invention of the telegraph and telephone and radio came the opportunity to transmit reports of weather conditions from all over a country to central bureaus. This method was first tried in 1849 in the United States. However, this system necessitated the recording of the observations in some scientific manner. This was first achieved by Professor Buys Ballot, of the University of Utrecht, Holland, who made a weather map on which was recorded daily observations about the weather. The weather map has been greatly developed since then, and today our daily newspapers publish a map giving all weather information in as complete a form within the scope of present-day knowledge.

The present-day forecaster must be defended against those who claim that forecasts are wrong all the time. Unfortunately, it is a trait of human nature that man registers most that which displeases him. This is to the detriment of the weather man, whose forecasts are always right for the time at which they are made. If the condition present at the time the forecast is made persisted, all forecasts would be correct for many hours afterwards.

But conditions change very quickly at times and very often the conditions on which the forecast is based cease to exist quite suddenly. To be really accurate forecasts should be published at frequent intervals.

Again, the forecast depends on the reports telegraphed from outlying country districts. In this country not many facilities exist for round-the-clock observations, and here again the weather man is at a disadvantage. But, taken on an average, our forecasts are fairly accurate, but we notice the wrong ones more because these, as far as the city dweller is concerned, are those which cause him to get wet or spoil his weekend sport.

BLIND MAN'S RADAR DETECTOR



Victor Twersky, a senior at the College of the City of New York and a physics Major, shows the experimental "sound beam box" designed for the detection of obstacles by blind persons. Still in the testing stage, the box is the result of two years of research by Twersky and two other students, Alfred Didea and Hilda Laufer, who worked under the direction of Dr. William Etkin, Professor of Biology at the College. The box, about the size of a flashlight, contains an electronic tube which is used to emit a directed beam of high frequency sound, only upon obstacles directly in the path of the person using it. Twersky's brother, Jacob, has been blind since childhood.

Mullard

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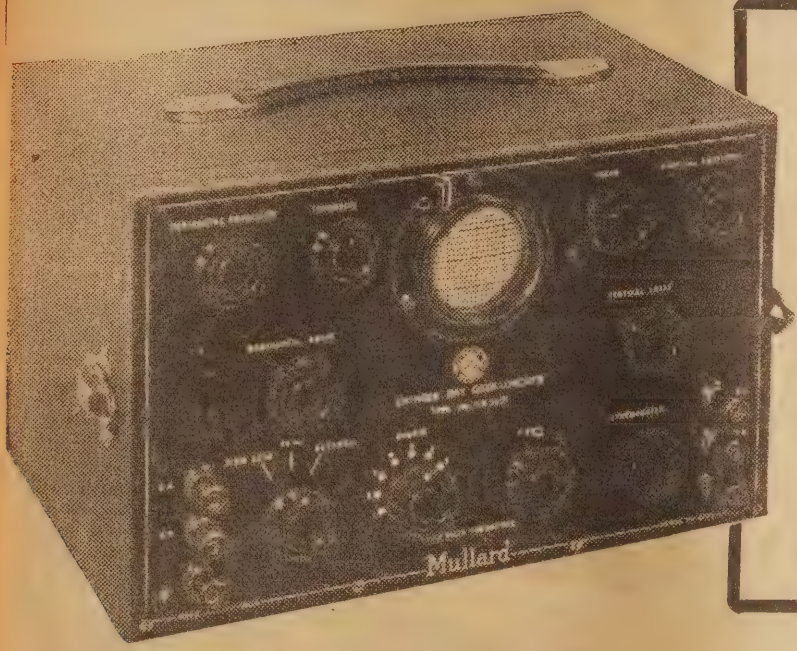

GM 3601

This new Mullard Cathode Ray Oscilloscope has been designed for laboratory and general purposes, including production testing and radio service. The unit is of robust construction, and is contained in a black crackle-finished steel case, fitted with a removable protective cover. A convenient carrying handle is provided, and the unit is mounted on rubber "feet". Indication is given by a standard two-inch C.R. tube, provided with a metal hood and graduated scale.

Inbuilt amplifiers with continuously variable gain controls are provided for both horizontal and vertical plates. Standard terminals are fitted, so that connection may be made to the horizontal and vertical plates, either direct or through the amplifiers.

Price £41 5 0

GM 4140

Measuring Bridge Type GM4140A has been designed for laboratory and general use for the measurement of resistance and capacity.

Both resistance and capacity measurements may be read directly from the scale of the instrument.

The balance indicator consists of an electron base indicator working in conjunction with a high gain pentode valve amplifier, the degree of sensitivity being continuously variable by means of a potentiometer.

This indicator warrants special attention, as, being of the electronic type, it eliminates parallax errors, is entirely inertialess and unaffected by vibration. The high degree of accuracy is unaffected by mains voltage fluctuations and is maintained over the entire measuring ranges. The instrument is housed in a metal case.

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HOW IT WORKS—THE BLAST FURNACE

MODERN civilisation is built on the use of iron, generally in the form of steel.

One of the commonest of the 92 chemical elements, iron, in combination, has been calculated to make up about 5 per cent. by weight of the earth's crust, and some experts have surmised that in the unknown depths there is a larger proportion of iron. It enters into most rocks and earths, the chlorophyll of plants, and blood corpuscles.

Uncombined iron is practically unknown in Nature, and it has to be released from the grip of other elements in order to take the metallic form.

During ancient times and in the Middle Ages, the highest output of a furnace was three or four tons of iron a week. Four loads of timber were needed to make each ton of pig iron, and three additional loads to convert the pig iron into bar iron. It took more fuel and labor to convert the iron bars into steel.

IRON ORES

Today the bulk of commercial iron is produced from four ores, the chief being oxides (haematite, magnetite and limonite) and one (siderite) a carbonate.

Haematite is the most widely distributed and important ore. Most of it looks like soft red earth. Iron carbonate or siderite is a hard crystalline grey or brown ore that can be profitably worked only when abundant cheap fuel is available locally. Iron pyrites (a compound of iron with sulphur) is used in enormous quantities in making sulphuric acid.

The ores are generally mixed with impurities, such as silica, alumina and lime. A rich ore contains more than 50 per cent. of iron; an average ore 35 to 50 per cent.

In smelting ore to produce iron, it is necessary to accomplish three things:

- To get rid of the impurities with which the iron oxides are mixed.
- To release the iron from the oxygen with which it is combined, and
- To stiffen the iron by mixing with it just enough carbon.

This is achieved in the heat of a blast furnace—the first by lime, the second and third by the carbon of the fuel loaded into the furnace with the ore.

MODERN FURNACE

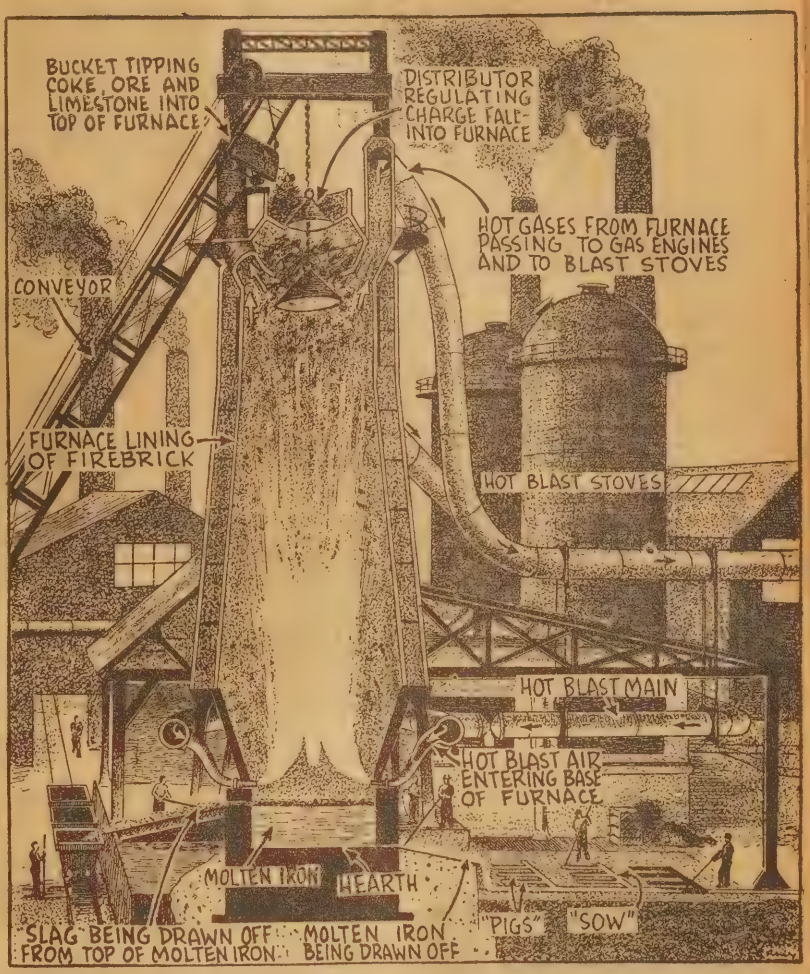
The modern blast furnace is a great tower or chimney, 100 feet or so high. Near the base, pipes admit the forced draft or "blast."

The iron ore, mixed with coke and broken limestone, is hoisted to the top of the furnace and dropped in on the blazing fire, whose heat is intensified by blasts of hot air. At a temperature of 2800 to 3000 degrees Fahr., the iron and the oxygen of the ore separate, the released oxygen combining with the carbon of the fuel and passing off as carbon dioxide gas, while the molten iron, holding a little dissolved carbon, drips down to the hearth of the furnace.

The calcium of the limestone flux seeks out the earthy impurities of the ore and unites with them to form a glassy scum or "slag." This, being lighter than the molten iron, swims just above it.

In some furnaces the molten iron is drawn off directly into sand moulds or troughs bearing a fancied resemblance to a family of little pigs lying alongside their mother and feeding. Hence the term "pig-iron" is applied to the product of the blast furnace.

Sometimes the liquid iron is rushed to the steel mills to be made into steel before it cools.



The value of iron and steel outbids almost any other element in its value to mankind and the development of civilisation. This article tells of one method used today in the extraction of iron from the earth.

Sketched here in diagram-form is a modern blast furnace. Ore is being fed into the top of the furnace, together with coke and limestone. This material is distributed evenly by cone-shaped regulators.

DRAWN OFF

Under the effect of the heat, the iron is released. It is drawn off from time to time at the bottom of the furnace, where it runs into channels in the sand.

The slag is drawn off from a special outlet a little higher than that through which the iron flows.

The hot gases from the furnace are conducted through a pipe to gas engines, which work air-compressors for the blast.

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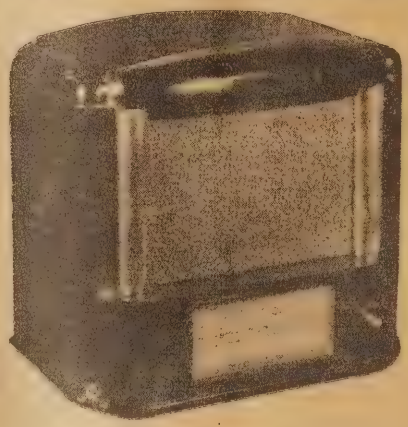

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NEWS AND VIEWS OF THE MONTH

Atomic Power

LITTLE by little, the possibility of using atomic power for industry is becoming clearer. Competent authorities are now estimating that within 15 years there should be enough known about the matter for practicable designs to be built.

Main trouble at present seems to be the difficulty of controlling and handling the actual power generation, which can be so dangerous without proper precautions.

For that reason alone, the first applications are almost certain to be found in large power plants which may be considered as permanent installations. Even the largest ocean liners might be considered as coming within this category. But for motor cars and aircraft, the position is much more obscure.

Important factors having a direct bearing on the subject are international and political interests. The certainty that knowledge will not be shared on this basis is bound to limit the rate of progress.

German Progress

IF it is true that the Germans had actually succeeded in making an experimental atom bomb, then the small margin of time on the side of the United Nations in the last war becomes more evident. Reports are that a shell enclosing an atom "head" was fired upon a village of 20,000 inhabitants, all of which, with their village, were incinerated.

The truth of the report need not be doubted, for it is known that the Germans possessed the facilities at least for such an experiment, their difficulty being more that of full application and development. Other evidence is available to support the fact that the Germans were very close to unleashing their final secret weapon, the rocket projectile with an "atom" warhead.

W.I.A. Convention

THE 1947 Federal Convention of the Wireless Institute of Australia will be held in Melbourne during Easter. On the agenda paper which has come to hand are items which make it clear that all the Divisions are desiring a Federal Constitution to cover the operation of the Divisions as well as Federal Headquarters.

Actually, this matter was thrashed out at the 1946 Convention, but the draft for the new Constitution so far produced does no contain a section providing for Divisional Constitutions.

It may not be practicable to work out a comprehensive statement which will provide as fully for Divisional operation as is possible for the operation of Federal Council and Executive. It is quite possible, however, to prepare a section dealing with

TOP—The wire-recorder, a wartime development, has been tailored for use as an office dictation machine. There are several microphone types of the device available, equipped with foot controls and headset for use by secretaries. Voice sounds—like telephone conversations, conference proceedings, news reporting—can be recorded by the device. The machine is now in production and has a market price of $400. Here Charles P. Pierce, president of the Pierce Magnetic Wire Recorder Corp., Evanston, Ill., demonstrates how the machine is used for dictating letters.

BOTTOM—Transcription of the wire recording is a simple operation. Here office secretary Arline Seymour demonstrates how the speed and tone control is accomplished by the use of a foot pedal that will start, stop and reverse the wire. The same results can be achieved by a hand operating device that fits on to the typewriter immediately beneath the space bar. The wire recording dictation machine incorporates the principle of magnetic electronics in which the sound is transferred into electrical impulses which are in turn changed into magnetic impulses that automatically magnetise the specially designed metal wire.

RED LINE

TRANSFORMERS

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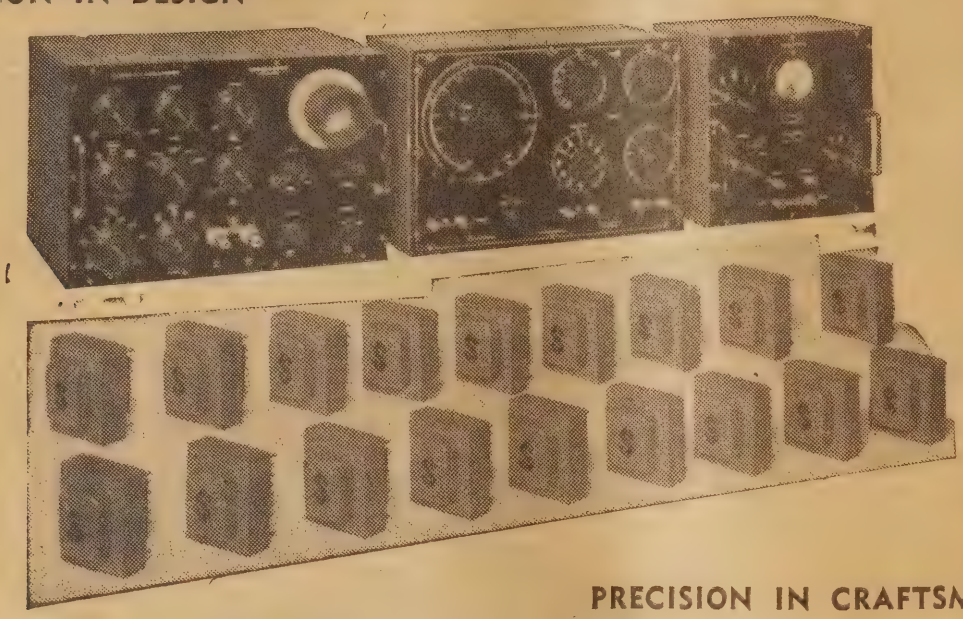

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A GUARANTEE OF DEPENDABILITY

NEWS AND VIEWS

(Continued from Page 19)

divisions which will lay down quite definitely, the main structure upon which they will function, leaving to their discretion minor matters which may not apply equally to all.

In many cases, the clauses in the Constitution may contain qualifications which will allow the comparatively small Tasmanian Division, for instance, to carry on with a small local committee or council, whereas a larger Division such as NSW or Victoria may require a bigger one to function efficiently. But grades and qualifications for membership, privileges of membership grades, voting powers, &c. must be made uniform once and for all, and in the clearest possible terms.

As we have pointed out on previous occasions, the Institute for probably the first time desires as a whole to tie itself together under a single constitution which cannot be altered either in Federal or Divisional organisation, without the agreement of members as a whole, no matter in what State they live. If the opportunity is not taken now, it may either be lost for ever, or force a break in the ranks. It is certain that this point of view will be urged very strongly at the Convention. It has been in all our minds for the last twelve months.

Leak Detector

A MASS SPECTROMETER recently devised to check leaks in vacuum apparatus or other airtight equipment is sensitive enough to detect a leak so small that it would take more than a thousand years to deflate an ordinary auto tyre.

The leak detector discovers helium gas in quantities as small as one in 400,000. The gas is sprayed over an area suspected to contain a leak and as soon as an ultra-minute quantity has pentrated the vacuum space, its presence is indicated.

Immediate application of the detector is for tests of high-vacuum equipment, ranging from ordinary radio tubes to the gigantic vacuum chambers used in atom-smashing apparatus. It is expected to find employment also in the chemical industry and other fields where high-vacuum processes are important.

X-Ray Analyzer

A NEW kind of "seeing" instrument, whose X-ray vision can detect counterfeit coins, spurious diamonds, and certain impurities in many types of solid liquid, or gaseous materials, has recently been developed. Called the General Electric X-ray Photometer, the device is a rapid, accurate analyser able to indicate within a second or two the concentration of certain chemical elements in the presence of others.

Plus its potential role as a detective, the instrument is expected to find application determining sulphur content of oil, tetraethyl content of gasoline, ash content of coal, heavy metal content of glass, and concentration of fillers and impregnating agents in wood, cloth, and rubber.

OPERATIONS NOW TELEVISED

What may well be an historic event was carried out recently in USA when an operation was televised for the benefit of observers at the Johns Hopkins Medical and Surgical Association in Baltimore. It took place on February 28 as an experiment in surgical teaching.

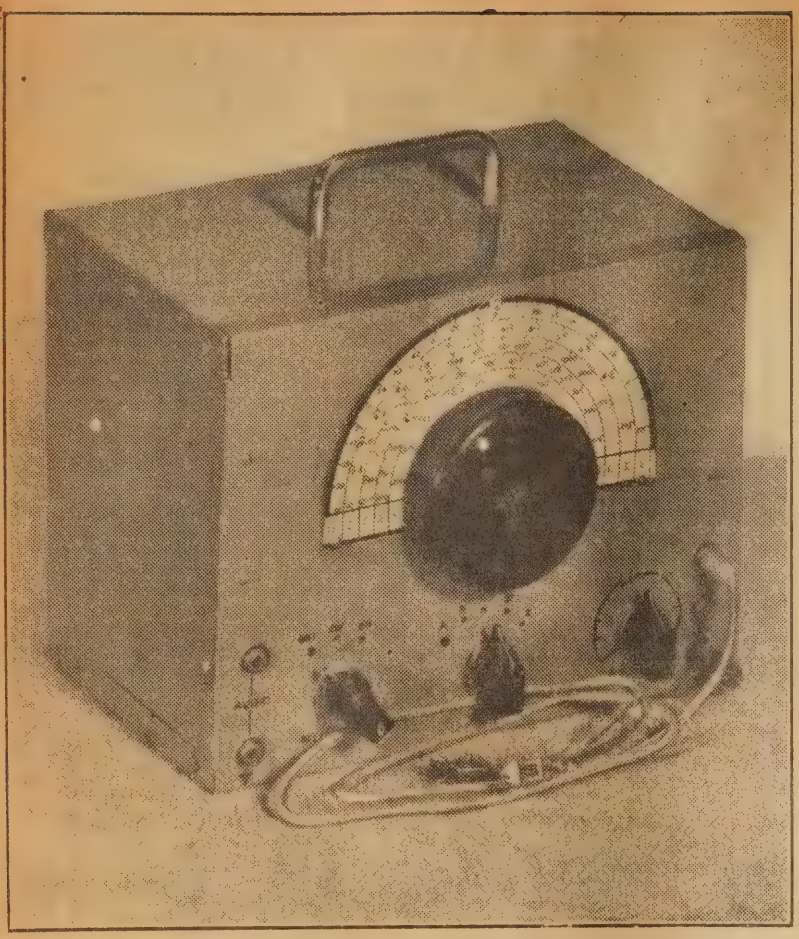
Radar Studies Atom

Speaking on the atom at University of California, Professor Ernest O. Lawrence of cyclotoron fame told physicists that radar equipment will be used to energise a *linear accelerator*, a device in which the particles to be speeded up are projected down a cylinder divided into sections. An electrical charge is applied to each of these sections at the correct instant to give the moving particle an accelerating impulse.

Fifteen radar sets, each connected to one section of the accelerating tube, will furnish the shocks which speed up the particles.

The linear accelerator is not a new device, but was abandoned in favor of the cyclotron because before the war no devices existed which could supply large amounts of power at high frequencies. Accelerations of two million volts were the utmost that could be obtained. With postwar apparatus, a billion volts is a theoretical possibility.

Helicopters are coming now in all sizes, including pint-size. This lucky lady appears all set for a flip in one of the smallest aircraft built.



The finished job is neat and workmanlike. Calibration may be made by checking against another accurate oscillator or signal generator.

This oscillator covers a range from 150kc to 30mc in five switched bands. The coils are mounted on a small unit for easy construction and connection. Being battery operated, it is completely portable and has low leakage. It is ideal for general service needs, and its small cost brings it within reach of any home builder.

AN ALL-BAND OSCILLATOR

by W. N. Williams

IN approaching the design of this oscillator, we were much exercised in the matter of cost and complexity. One could set out with the idea of designing an ambitious instrument, organising such things as a special attenuator system, special coil kit and calibrated dial.

The alternative was an instrument which would be just as simple and cheap to build as it could possibly be, consistent with reasonable performance. In making the decision, we were influenced by the fact that there are already on the market several excellent commercial oscillators, ideal for service work and not prohibitively priced for an established business.

Against this, there has been a consistent demand in our mail for a simple instrument for experimenters and part-time servicemen who cannot justify the outlay for one of the commercial jobs, attractive though they may be.

With these thoughts in mind, we decided that this instrument anyway must be of inexpensive design, so that the problem then became one of achieving the economy and simplicity to the degree sought.

Physically, the instrument must be housed in a metal case, but anything more than a straightforward rectangular box was barred. One or two auxiliary brackets could be tolerated, but no more. And the job had to be done with a single valve of any suitable type.

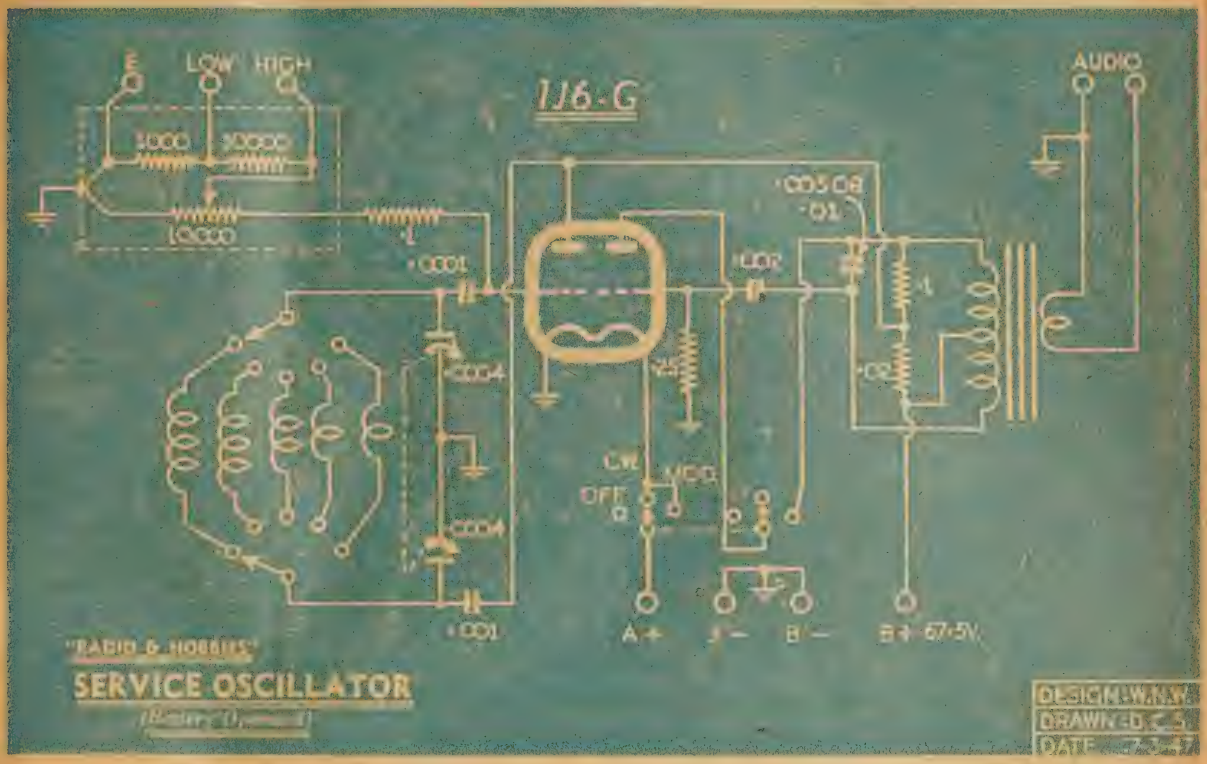
Then there was the matter of battery versus mains operation—and one can make out a good case for both. A battery power oscillator using small batteries can be completely self-contained, needing no connection to the power mains. This is an obvious advantage and batteries will last for practically their shelf life if full use is made of the "off-on" switch. Also, elimination of the power cord cuts out a prolific source of leakage and unwanted coupling between the oscillator and the receiver under test.

Against all this, batteries do have to be replaced and they are only a proposition if the oscillator is to be used fairly consistently. If it is likely to be put away for two or three months between periods of use, one is likely to find the batteries flat just when they are needed most.

Since there is an obvious call for both types, we have planned ahead to describe both battery and mains operated versions. Here is the battery job, and the a-c job will follow in due course.

One of the governing factors in an

CIRCUIT DIAGRAM OF THE OSCILLATOR



The circuit shows that a Colpitts oscillator circuit is used, thus allowing single winding coils to be employed.

oscillator is the matter of coils. For convenience in operation, only switched coils can be considered, so that it becomes a problem of obtaining coils of the right inductance, yet small enough to group tidily around the band switch. A simple problem if your workshop is equipped with a honeycomb coil winder—but not many are so fortunate.

COILS AND EXPENSE

There was a possibility of having the coils made up as a kit, but this course was rather divergent from our plans for the instrument. A coil kit is nice to have, but we wanted this instrument to be one capable of construction entirely in the home builders' workshop.

The negative transconductance oscillator described in December, 1944, came to mind, since it used single windings taken from discarded IF transformers and coils. No feedback winding is required, so that the problem is much simplified.

Accordingly we built up a battery version of this oscillator using a 1A7-GT converter valve. The RF portion operated well enough but modulation was the problem. The negative transconductance oscillator is very prone to frequency shift with modulation and attempts to combine the functions of RF and audio oscillator in a single 1A7-GT valve were not successful. The modulation was as much FM as AM in character. The scheme was shelved, because we did not want to use a second valve for modulation.

However, there is another two terminal oscillator circuit which is widely used in commercial instruments, namely the Colpitts. It calls for a two-gang tuning condenser, but this is no great problem. Single gang condensers are not over-plentiful just now and two gangs can be bought without difficulty and at little extra cost. Weighing up the various factors, it seemed the best way out of the difficulty.

As for the valve, the obvious choice became the 19 or 1J6-G, or its less common 1.4 volt equivalent type 1G. One section could be used as RF oscillator and the other as audio oscillator.

Now for the coils. Assuming that most experimenters have a few spare or discarded parts on hand—and this is generally so—the coils will not entail much outlay.

The lowest frequency normally required is 175 kc for I.F. alignment in old-style superhets. We "dug up" an old 175 kc. transformer with one faulty winding, and completely dismantled it. The good winding was duly discon-

PARTS LIST

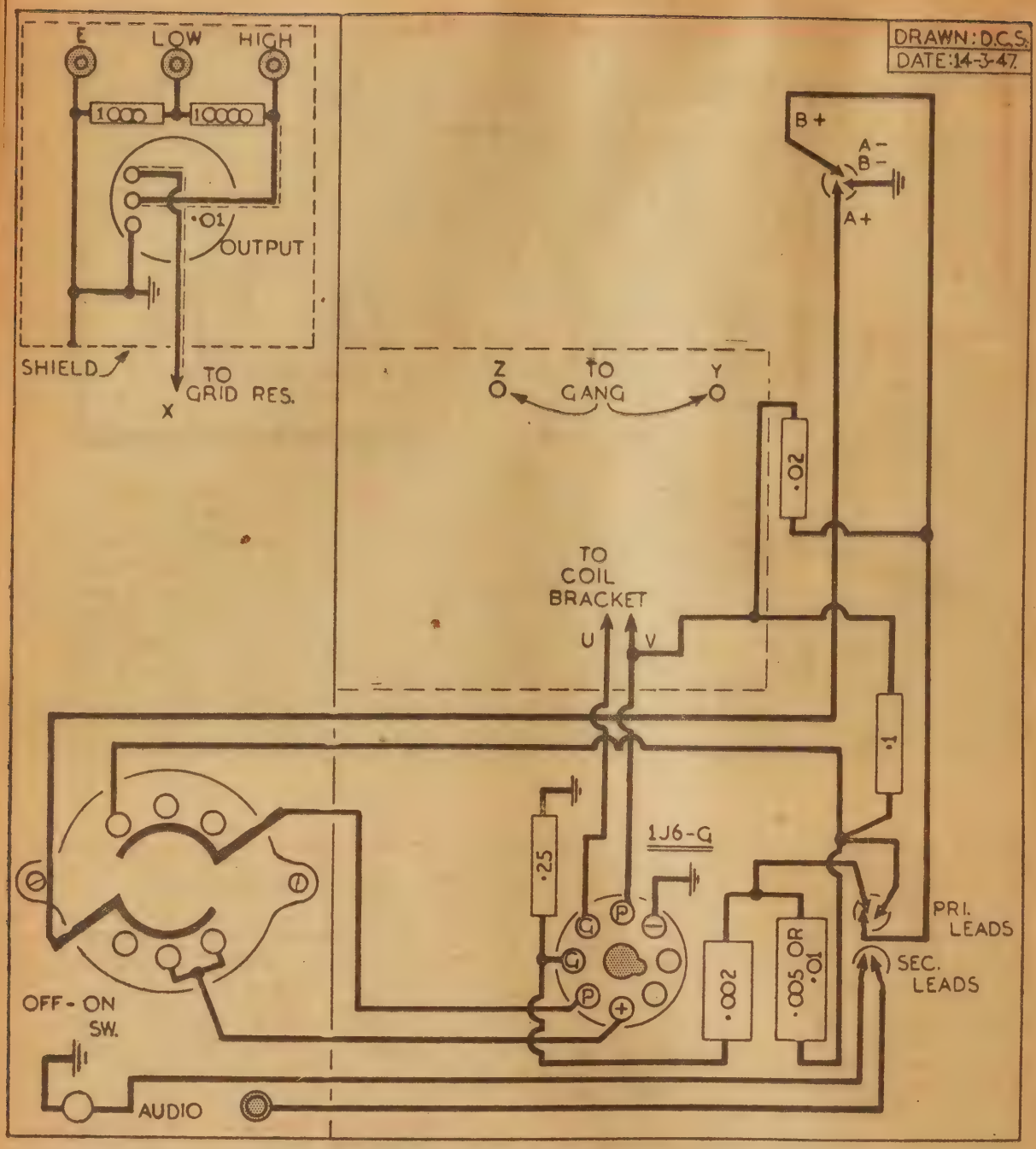
1 Chassis 8¾in. x 5½in. x 2½in. (steel or aluminium).
1 Shield box 9in. x 7in. x 5¾in. (steel or aluminium).
1 Front panel with flanges to fit box.
3 3in. x 4in. angle brackets (left and right hand).
1 Two-gang tuning condenser.
1 Vernier dial to suit.
1 Loudspeaker transformer, push-pull primary.
1 1J6-G or 1G6-G or 19 valve.
1 10,000 ohm potentiometer (carbon if possible).
1 3x3 single bank wavechange switch.
1 2x5 single bank wavechange switch.
3 Pointer knobs.
5 Pin jacks with insulating washers.
1 Octal socket.
1 .01 mfd. tubular condenser.
1 .002 mfd. mica condenser.
1 .001 mfd. mica condenser.
1 .0001 mfd. mica condenser.
5 Piston type air trimmers.
1 .25 meg. resistor.
2 .01 meg. resistors.
1 20,000 ohm resistor.
1 10,000 ohm resistor.
1 1000 ohm resistor.
5 Tuning coils (see text).

SUNDRIES

Nuts, bolts, solder lugs, hook-up wire, tinned busbar, 2 two-position resistor strips.

BATTERIES

3 1½ volt torch cells (U2 or similar).
1 67½ volt "Minimax" B-battery.



The wiring is quite simple, largely due to the unit construction of the coil bracket. Batteries for power supply simplify matters still further.

nected from its trimmer, the wooden dowel cut through with a hacksaw, and there was our 175 kc. coil, compact and ready to mount. When subsequently installed in the oscillator, this coil, without modification, tuned from below 150 kc. to 300 kc.

In just the same way, a 465 kc. winding was obtained from another discarded transformer and this tuned from 275 kc. to about 800 kc. Just the right amount of overlap and this second range caters for I.F. alignment and the low frequency end of the broadcast band, where the padder and/or iron cores are adjusted

The third coil was the grid winding from an old air-cored pie-wound broadcast coil. Either aerial or R.F. will do, but the primary should be removed. This coil tuned from about 775 kc. to 2100 kc., which takes in the rest of the broadcast band and alignment of high frequency I.F. transformers, 1600-1900 kc. Perhaps we were lucky in our random selection of odd windings, but that is just how the band coverage and overlap worked out.

SHORT-WAVE COILS

The short-wave bands presented no great problem. The largest coil was close wound with 37 turns of 28 B&S gauge enamel wire on a half-inch diameter former. This covered from just under 3.5 megacycles to 10 megacycles There is therefore a gap between 2.1 and 3.5 megacycles, but this is not a very important part of the spectrum for ordinary service requirements. An extra coil and switch position necessary to close this gap was not considered worth the complication

The final coil covers from 10 to 30 megacycles and is wound with 12 turns of 28-gauge enamel wire, on a half-inch diameter former, screw cut at 16 T.P.I. We found that this gauge gave the best results, finer or heavier gauge wire resulting in poorer oscillation.

In building the oscillator, the coils

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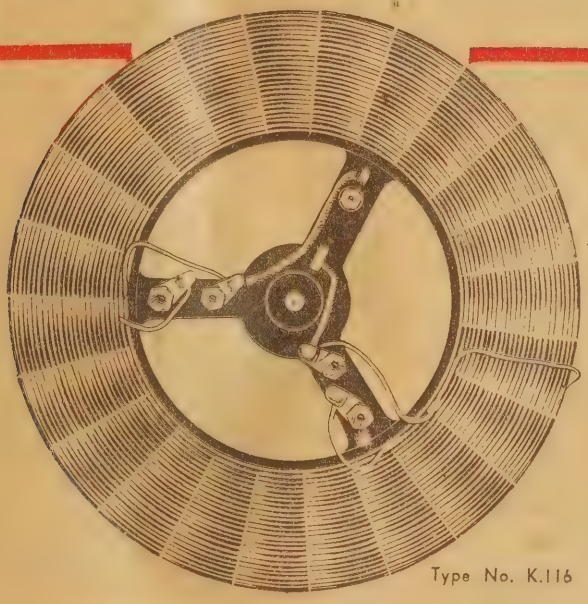

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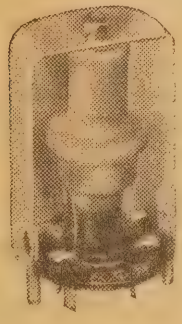

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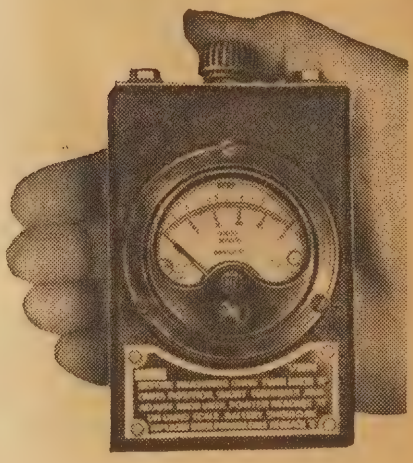

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(Above left)

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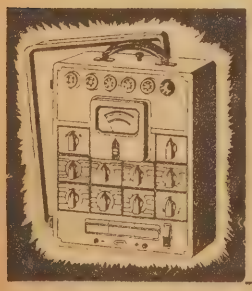

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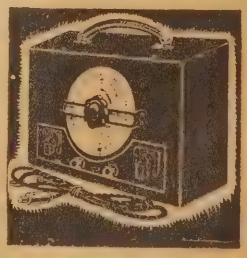

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could have been grouped around the switch and mounted directly on to the chassis. The completed job, however, is likely to be rather "haywire" in appearance, and we elected to assemble the coils and switch on a metal bracket, which could then be installed as a complete unit in the oscillator.

The bracket is actually quite simple to make, being bent up from a strip of aluminium 8⅜in. x 3½in., folded over three times. The nature of this bracket can be seen in the accompanying photograph.

One end of the strip is folded over to form the front of the bracket, this section measuring 1⅜in. x 3½in. The base of the bracket measures 3½in. x 4in., the rear section 3½in. x 2½in., and the odd half-inch is turned inward to form a flange. Two holes are drilled in this to receive the two bolts which mount the gang condenser.

TRIMMER CONDENSERS

In making up the coil bracket, provision was made for five trimmer condensers, one for each of the bands. The trimmers are not essential, but they do give some control over the coverage at the high frequency end of each band. Some adjustment is therefore possible to keep the frequency "on the dot" with dial calibrations. The trimmers are across the grid side of the tuned circuit, which tends to increase slightly the feedback voltage

But please yourself about the trimmers. They are a purely optional refinement. However, use good ones or none at all. Trimmers which alter their capacitance with temperature or humidity are more likely to be a hindrance than a help.

To make the coil unit completely rigid and self-contained, the plate and grid series condensers were mounted in it, together with the oscillator grid resistor. The outgoing connections for the plate, grid, gang condenser and attenuator were terminated in small pieces of resistor strip, one mounted on each side of the unit.

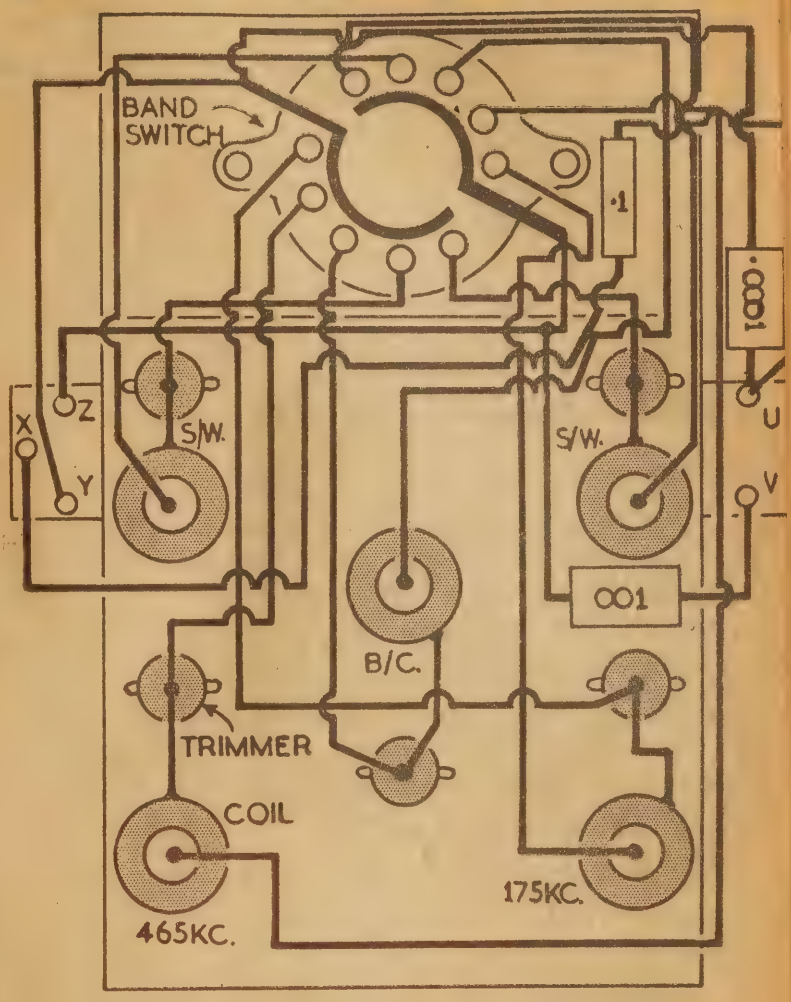
THE COIL UNIT

The photograph and diagram show just how the coils and trimmer condensers were arranged in the original unit, the lay-out minimising chance of absorption effects between coils on adjacent bands. The coils wound on wooden dowels mount direct to the base plate with small woodscrews. The coils on open cardboard formers can be attached either by lugs or by cementing a short length of dowel in the centre and driving in a woodscrew.

The trimmers used in the original unit had two 5BA screws, the adjustment screw being accessible through a small hole in the base plate. This is probably the ideal arrangement, since the trimmers can be adjusted easily after the unit is mounted on the chassis.

The unit is best wired with about 20-gauge tinned copper, 1 mil. spaghetti being slipped over any lead likely to foul other wiring. Considerable care is necessary in wiring up the unit, as it is very easy to become confused with all the coil leads and switch connections to worry about.

WIRING DIAGRAM OF COIL UNIT



This diagram shows how the coil unit is connected.

One end of each coil—it doesn't matter much which end—should first be connected to its associated trimmer. Set the switch to one extreme position, select the grid and plate rotors, and wire the 175 kc. coil across to the switch. Remember that the trimmer must go on the grid side of the tuned circuit.

WIRING PROCEDURE

Now turn the switch to position 2 and wire up the 465 kc. coil. The remaining three coils can be wired in the same way. Turning the switch to each new setting will show clearly the position of the moving contact and minimise chance of confusion. After that, it is a matter of adding the terminal strips, putting in the two condensers and the grid resistor and completing the wiring ready for connection into the main chassis.

It is noteworthy that the output to the attenuator is taken from the end of the 0.1 meg. grid resistor. This resistor is therefore terminated in a lu just near the attenuator box. By thi means the length of lead going int the attenuator can be kept to litt more than half an inch.

The construction of the main chas sis is not a very difficult process. Th gang condenser should be mounted s that its spindle is located on the centr line of the panel, the height being de termined largely by the gang condense used. An "H" type was employed i the original oscillator, mounted so tha the spindle was just over four inche from the bottom of the panel.

Before finally mounting the gang in position, it will be necessary to deter mine the type of dial to be used. An smooth action front-of-panel vernie will do, provided it is calibrated clearly The dial used in the original is a modern instrument vernier type, now available on the market. It drives a celluloid cursor and is intended for use with a directly calibrated scale.

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The dial employed in the original has provision for a 3-8in. diameter shaft. If you plan to use a dial with only a ¼in. diameter shaft, it may be necessary to move the gang back and add an extension spindle stepping down to ¼in. diameter. There is plenty of room on the chassis for this to be done.

The oscillator valve mounts alongside the gang in the position shown, with the modulation transformer immediately behind it. This transformer is a standard push-pull type of medium dimensions and its connection into the circuit is quite straightforward.

MODULATION FREQUENCY

The inductance of the primary winding, together with the associated components, controls the modulation frequency. Although the values shown in the circuit have worked out very well in a couple of oscillators to date, it is conceivable that the note may be higher or lower than the usual 400 cycles. The note can be varied by increasing or decreasing the value of the .01 mfd. condenser across the winding, by changing the value of the grid resistor or by loading the winding with a parallel resistor between 20,000 and 100,000 ohms.

An angle bracket is bolted between the panel and chassis at each end of the instrument. If making these, see that you turn the flanges in opposite directions, so that the two will form a pair.

A third angle bracket is required which is mounted just alongside the gang condenser. By carefully measuring the distance, the batteries can be pushed snugly between the two brackets, the leads passing straight down through a hole in the chassis.

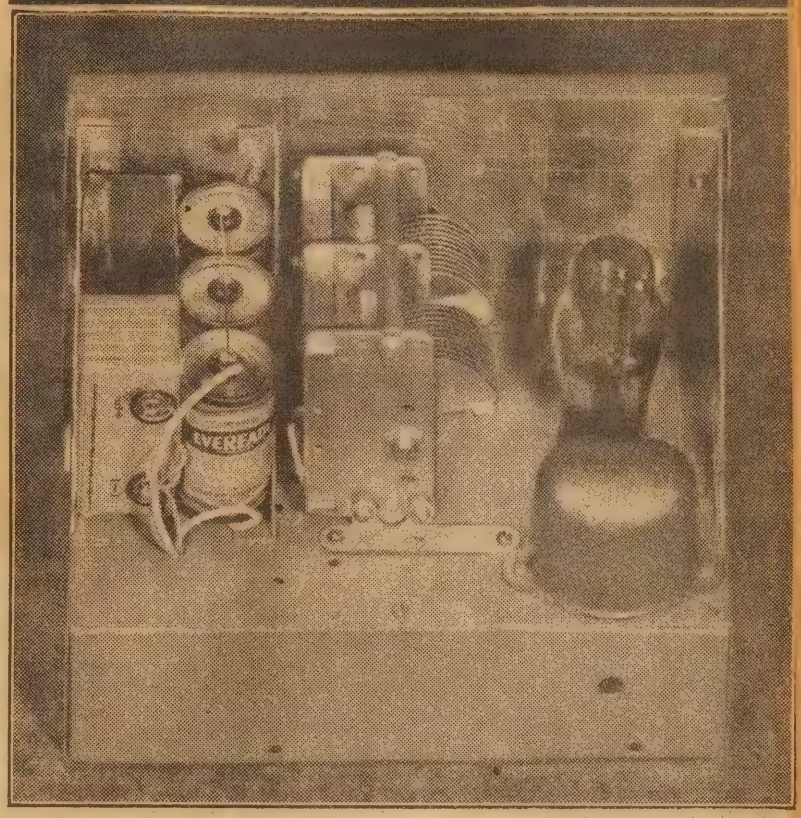
FILAMENT SUPPLY

Three type U2 torch cells are used for the filament supply, and these occupy about the same space as the Minimax B-battery. Before placing the cells in position, solder a length of busbar straight across the positive terminals and another length across the bases of the cells. It does not matter if this last wire touches the chassis, as A-minus is earthed, in any case.

Underneath the chassis there is the 3 x 3 "off-on" switch and the few odd components grouped around the valve socket.

The attenuator system calls for some comment. In a simple instrument of this type, nothing elaborate can be attempted in the way of an attenuator, and we simply used a 10,000 ohm potentiometer, with the sliding contact connected to one output terminal. Try and obtain a carbon type for this position, even if it means a trip to the distributor to get it. The earthed spindle of the carbon type prevents leakage via the control, while the carbon element does not exhibit troublesome inductive qualities. Also the metal cover can be earthed.

REAR VIEW OF THE OSCILLATOR



To the right is the modulation transformer. A single 67½ volt Minimax lies on its side as shown—if two are used, they should stand on end, side by side.

To obtain better control at low output levels, two non-inductive resistors are used to supply a second "low output" pin jack. We used a 10,000 ohm and a 1000 ohm resistor in this network, but a 100 ohm can be used in place of the latter if it is found to give better attenuation.

The whole of this attenuator network must be contained within a small metal cover bolted to the sides and top of the chassis and enclosing the potentiometer, the two resistors and the three output jacks. A single lead out through the side of the box takes the RF output from the low potential end of the grid resistor.

MODULATION PERCENTAGE

There is not much more to the design of the instrument. Modulation is applied to the RF oscillator by feeding it from a resistive network across half the modulation transformer. The two resistors are selected to give a suitable degree of modulation, although it can be varied by altering the value of the upper resistor, shown as 0.1 meg.

The output of the audio oscillator is likely to vary from one instrument to another, while the amplitude of RF oscillation is bound to vary with frequency. There can, therefore, be no question of arranging for an even 30 per cent. modulation at all frequencies.

In the central position the "off-on" switch opens the plate circuit of the audio oscillator, so that the RF output is unmodulated. It was insufficient merely to disconnect the RF oscillator from the modulated supply, as there was sufficient leakage between the two sections of the valve to allow some modulation still to be apparent.

The two resistors supplying the high tension to the plate of the RF oscillator are virtually in parallel with one half of the tuned circuit, but this is unavoidable with untapped coils. When first wired up, we had an RF choke in series with the plate supply, but none of the standard chokes tried out were adequate to the task. Resonant absorption effects were evident at various frequencies and the inductance was inadequate for use with the 175 kc band.

The two resistors operate quite well without a choke, but the loading in parallel with the tuned circuit should not be heavier than that imposed by the 20,000 and 100,000 ohm resistors used.

The whole combination gives adequate oscillation on all bands except the 10-30 megacycle band, where the amplitude is relatively low. However, if the leads to this coil are kept short and direct and the bracket well bonded to the rotors of the gang and the negative filament pin of the valve, there should be no doubt about its ability to oscillate over the whole band.

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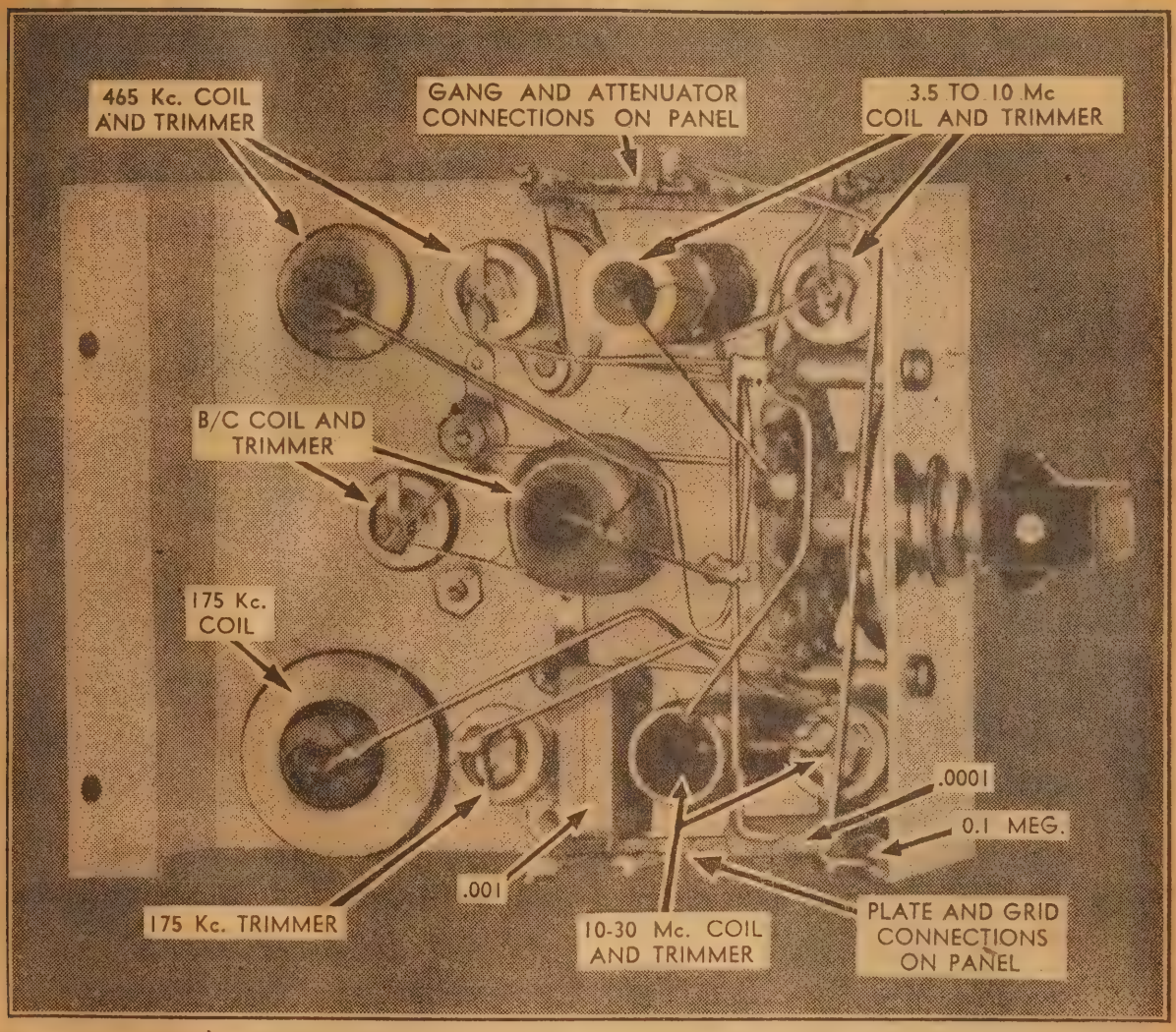

This is a close-up of the coil unit showing the position of the coils, trimmers, wiring and switch.

band, the performance can be improved vastly by using two 67½ volt batteries in series, giving a high tension supply of 135 volts. There is room on the chassis for the extra battery, although some revised arrangement would be necessary to hold them in place.

As previously stated, the oscillator must be housed in a metal case for shielding purposes. The original case was bent up from aluminium sheet, but a blueprint will be supplied to chassis manufacturers so that a steel box and chassis can be made available.

MUST BE SHIELDED

There can be no compromise in the matter of shielding. The oscillator simply must be housed in a complete metal box, or in a wooden box lined with metal. If this is not done, the signals will be radiated direct from the tuning coils and the wiring, being picked up by the set irrespective of connection via the attenuator.

The shielding was surprisingly effective in the original oscillator, the attenuator giving complete control over ouput right down to 10 odd megacycles. At progressively higher frequencies up to 30 megacycles some leakage was evident with the oscillator connected to the receiver under test. However, even at 30 megacycles, no signal could be picked up from the oscillator when standing alongside the receiver without being actually connected to it.

OUTPUT LEAD

Use a shielded lead to connect the oscillator to the set under test. A short length of light coaxial cable or microphone cable is excellent, but a couple of feet of ordinary shielded wire does quite well. You will need a couple of banana plugs at one end and two small spring clips at the other. One clip and one plug connect to the shielding and the other two to the inner conductor. Always connect up the leads so that the oscillator shield box is bonded to the receiver chassis by the metal braid.

The instrument can be checked for oscillation over the bands by connecting a 1 milliamp meter in series between the 0.1 meg. grid resistor and the input to the attenuator. You can expect a grid current of about 0.1 milliamp on most bands, except the 10-30 megacycle band, where the figure is more likely to be 20 microamps at the low frequency end—quite a small deflection on a 1 milliamp scale.

The subject of calibration is sufficiently involved to warrant a special article at a later date.

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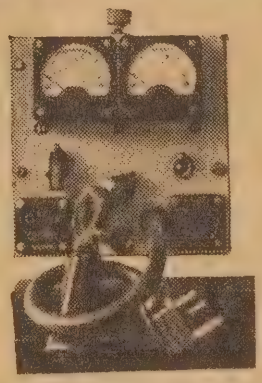

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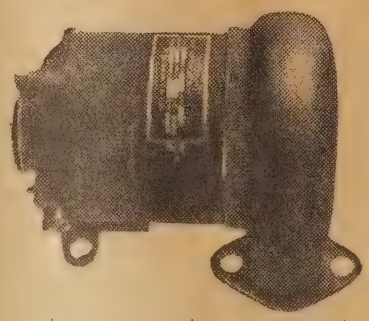

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A WIDE-RANGE TONE CONTROL

This article, taken from "Wireless World" for December 1946, is interesting as it deals with a subject on which we have given considerable thought from time to time. Our own tone control circuits, many of which have operated on similar lines, have demonstrated the value of their inclusion in a quality amplifier..

IF an amplifier is being designed solely for quality reproduction at fairly high volume level, tone control circuits are only required for relatively small corrections of recording or speaker deficiencies. In such a case it is not necessary to have a tone control circuit with a very wide range, and the many circuits already published are fully satisfactory for this purpose.

Many people, on the other hand, require an amplifier not only for the purpose of high-level working but also for low-volume reproduction, in which case the requirements of the tone control circuits are totally different. At low volume levels the ear is less sensitive to the extreme bass and top, and consequently, for good reproduction and pleasant tone, it is necessary to have a very great lift of the extreme bass, and also a fairly large lift of the extreme top. It is also an advantage if the tone control circuit has a position that is truly linear and not just half-way between top cut and top lift.

These requirements have all been met in the circuit shown in Fig. 1 which is designed to work straight into a push-pull output circuit. Three valves are shown, one being a double triode. The circuit gives a large overall gain, the input from a pick-up being sufficient to fully load an output stage of PX25's or similar valves.

The signal is amplified in the first valve after passing through the volume control and from the anode it is taken first two chains are connected to the ends of the "top" control potentiometer. The value of this potentiometer is high enough effectively to isolate the networks connected at the two ends, and consequently movement of this control from left to right gives a variation from a truly

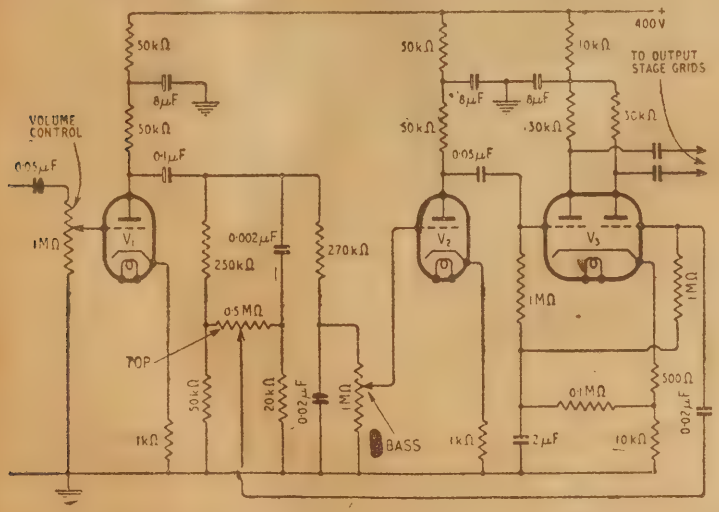

Fig. 1—General arrangement of wide range tone control circuit.

to three potentiometer circuits. The linear signal to a large lift of the higher register. An attenuation ratio of 5:1 is incorporated in the linear position to give constant volume over the whole range.

The "bass" control is incorporated in a normal bass lift circuit, the bass voltage developed across the condenser being tapped off on the "bass" control potentiometer. To get sufficient bass lift for low volume levels, or at any volume for those people who like it, it has been found necessary to amplify this bass signal in a separate bass amplifier valve V2.

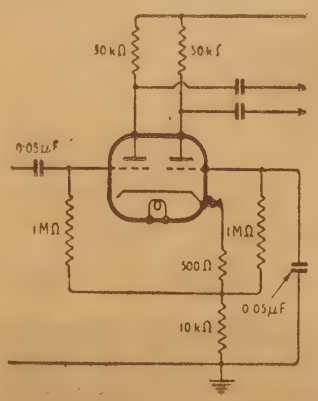

Fig. 2—Basic cathode—coupled paraphase circuit.

The two signals, the top and middle freqeucies from the top control potentiometer and the amplified bass signal from the anode of V2 are mixed together in the correct phase in the last valve, which also acts as a paraphase amplifier. The signals at the anodes are equal in amplitude and opposite in phase, each being the sum of the top and bass frequencies fed into the two grids.

CATHODE-COUPLED PARAPHASE

This last stage can be considered as being a modified form of the cathode-coupled paraphase amplifier. In this type of amplifier a current change in the first half of the valve causes a change in the common cathode voltage which produces an approximately equal and opposite change of current in the second half of the valve.

In the present circuit the two tone-controlled inputs are fed into the grids of the phase splitter simultaneously. The reason for mixing in this manner is that the bass signal has been reversed in phase in passing through V2 with respect to the signal being passed through the top control circuit. By feeding these signals into the opposite grids of the phase splitter the two signals are brought into phase at the anodes. A further advantage of this method of mixing is that there is no attenuation, as there is in the more usual resistance network method.

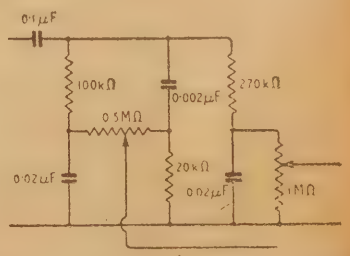

Fig. 3—"Top" control circuit modified to include top cut.

In the phase splitter valve the bottom of grids have been decoupled to earth to prevent any signal being fed up from the cathode to the grids, as this would cause a bad misbalance of the signals at the anodes.

The controls, as outlined above, give the following possibilities: (1) linear position; (2) top lift, bass cut; (3) very large bass lift. For completeness a top cut circuit can be included, although it is very unlikely that it will ever be required in view of the enormous bass lift available. The modification to the "top" cir-

(Continued on Next Page)

A Wide Range Tone Control

(Continued from Previous Page)

cuit is indicated in Fig. 3. The circuit is, however, not fully satisfactory, as at the middle position the output is not truly linear, but is effectively a half-way point between top cut and top lift (bass cut). This middle point will, unless values are very carefully chosen, give either middle hump or middle cut.

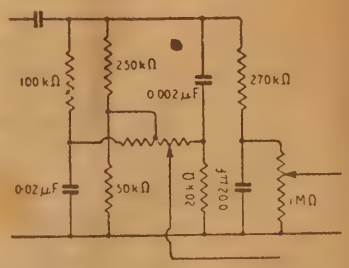

Fig. 4—Use of centre-tapped potentiometer circuit to preserve linearibility of middle frequencies when using modified "top" control.

To get over this diffculty a centre-tapped potentiometer is required. If this is not readily available an ordinary potentiometer can easily be tapped at the centre point by drilling a small hole in the insulated base of the potentiometer and screwing down a small washer to make a contact with the outside of the track not used by the slider. A potential-divider network is connected to this centre tap as indicated in Fig. 4. If the resistance of the two arms of this potential-divider is high compared to the resistances of the networks attached to it, the response at the centre point should be linear with no possibility of middle cut or middle hump.

A suitable valve for use in the first two stages (V1 and V2) in Fig. 1 would be the Mullard EBC33 (alternatives DL63 or 6J7, triode connected). For V3 a 6N7 or two 6J5's would meet requirements.

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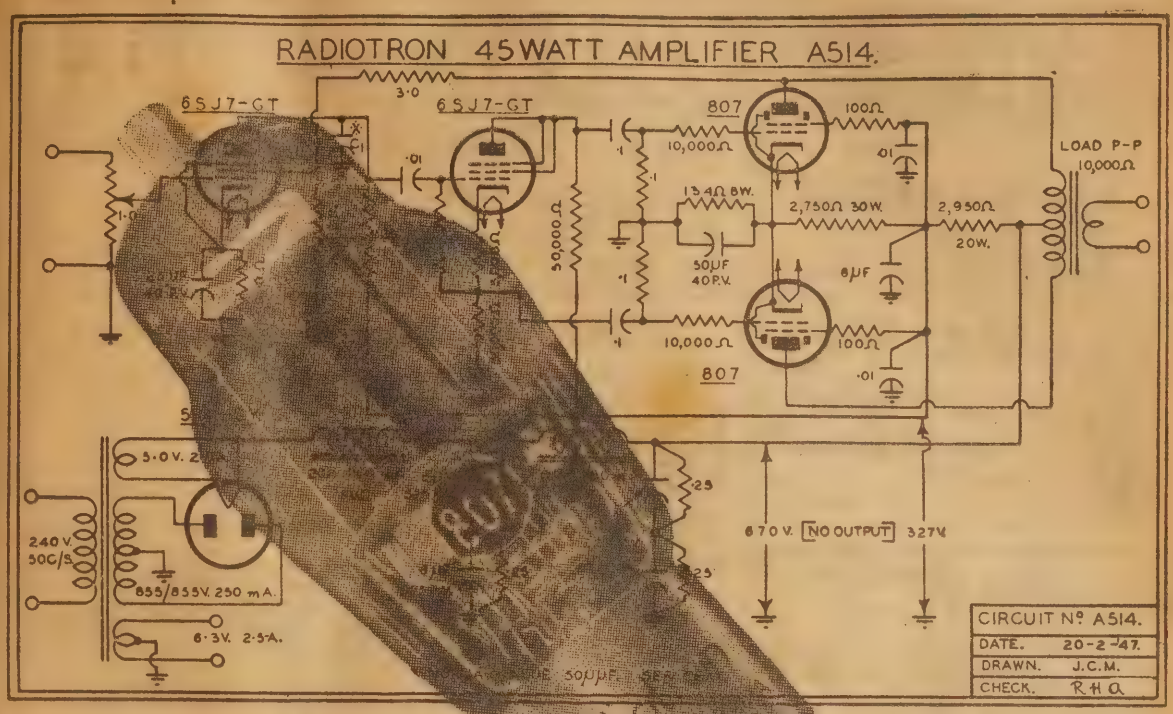

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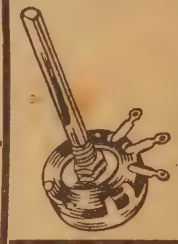

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PERSONAL recommendations arising from a job well done are invaluable to a serviceman, because they bring the best kind of business. However, a recent experience had its unfortunate side for "yours truly."

I had fixed up a couple of sets for a suburban businessman and he was not slow to tell his friends about the satisfaction received from my work. In fact, to do a good turn by someone else, he personally picked up their set in his car and dropped it into the shop in my absence with the request "that it be fixed."

The word "fixed" is horribly vague, as all servicemen will appreciate, and it is always helpful to get some idea of why a set is in for service. If it has stopped, all is clear sailing, but there are plenty of other reasons for complaint which are not so immediately obvious to the serviceman.

When the set was ultimately switched on, it worked like a charm and, indeed, I was immediately impressed by the quality of reproduction. Of about 1938 vintage, the cabinet was well built, the speaker completely free from rattle and, what turned out to be a special negative feedback system provided an agreeable amount of bass boost.

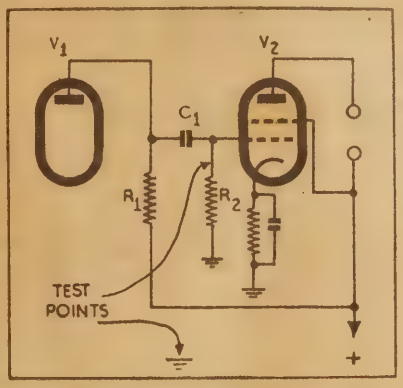
TONE WAS HORRIBLE!

After a few moments, I began to doubt first impressions and within a couple of minutes the tone was nothing short of horrible. A harshness and a choking effect indicated distortion of an electrical character, which had all the earmarks of improper biasing.

The chassis was duly removed from the cabinet and the volt-meter put over the circuit. The high tension voltage was near enough to the expected 250 volts and the cathode bias on the output valve was near enough to normal as not to explain the trouble.

However, placing the meter pointer on the grid of the output valve produced a suspicion of forward movement in the pointer, showing that there was a positive voltage on the grid. The high impedance of the grid circuit naturally prevented any accurate measurement of the voltage, but the mere indication of a positive potential was enough to indicate trouble. Had the set been back-biased, the absence of an apparent negative potential on the grid would have had exactly the same significance.

Most likely cause of a positive grid voltage is a faulty coupling condenser, so that one end of this was immediately disconnected. The positive voltage was still apparent, however,



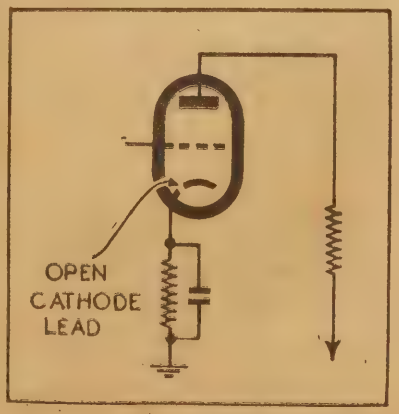
Test points to indicate grid current.

showing that the trouble was elsewhere. A check on the grid resistor showed that it was about 0.5 megohm, as marked, so that the valve became suspect.

NEW VALVE—OK!

Another valve—a 6V6-G — was plugged into the chassis and the distortion was no longer apparent. It was obvious, therefore, that the discarded valve had developed a grid current effect, and the flow of current through the grid resistor was sufficient to offset the effect of the cathode bias. Hence the valve was operating virtually with zero or even a positive grid potential. It only became obvious after the valve had been in operation a few minutes.

Just in passing, one may mention that this was a very common fault with the old 47-type output valves. They would work quite normally for a couple of minutes after switching on and then, often enough, choke right up with positive grid current. There was nothing else for it but a new valve with a little less atmosphere inside the glass envelope.



How an open circuit cathode internally can cause a fault.

In cases like this, I always make a point of testing the coupling condenser and the grid resistor. If there is the slightest doubt about either, they are replaced, since the cost of replacement is small when compared to the price of the new power valve whose end they might hasten.

Anyhow, the rest of the circuit was duly checked over and pronounced OK, and one naturally thought that the trouble had been located and put right. As arranged, the set was delivered by the mutual acquaintance back to its expectant owner. Then the fun began. Plugged into the socket it refused to operate at all, and an urgent message came back to the service shop.

WIRE FRACTURE

An on-the-spot examination revealed that vibration in transit had fractured a fine wire to the secondary of the short-wave oscillator coil. In this set the two oscillator secondaries were connected permanently in series, apparently to simplify the switching, so that failure of the short-wave oscillator circuit also put the broadcast band out of action. This was duly repaired on the spot and the set fitted back into the cabinet—only to play for a few moments and then drop suddenly to a whisper in volume.

At this juncture the owner volunteered the information that the set "has been doing that quite a lot lately. But we just switch it off for a few moments, then on again and it goes well for a while longer." Amazingly enough, the owner had never noticed the distortion which had been so painfully apparent to myself.

Anyhow, the set would play only at a whisper and the time honored test was applied of removing the grid clip from the first audio stage and touching the cap. Servicemen will be at a loss to do this when the new single ended valves make their appearance. The test revealed that the audio end was at fault, since only a faint buzz was heard in place of the expected raucous howl.

AUDIO FAULT

A slight tap on the glass of the 6B6-G audio valve restored the set to its former level and a further tap again cut the volume to a whisper. The fault was so obviously in the valve that there was no need to remove the chassis a third time. A tap, on the glass produced the variation in volume but swaying the valve in the socket had no effect—pretty positive proof that it was not a faulty socket contact.

Forunately another 6B6-G valve was to hand and replacement of the valve completely cleared the trouble. The

fault in the 6B6-G turned out to be an open circuit in the cathode lead inside the envelope—a common enough fault.

At this point we took time off to explain just the sequence of events to the owner who could perhaps have been excused for asking "what goes on?"

There's a moral to all this, of course. Get a case history of every set you attend to find out just exactly why the client thinks it "needs fixing." Then you won't spend undue time pepping up the short-wave performance when the real complaint may be fading or something equally elusive.

Spend time and money over the other possible faults only with the permission of the owner or if you are reasonably sure that he will appreciate your efforts on his behalf. Maybe he never does listen on the short-waves, anyway!

A MANTEL SET

Mention of an open circuit cathode lead recalls a personal experience a couple of years back. I managed to organise a fortnight's holiday, and the family mantel set went into the car. It had operated in house, workship and garden for quite a while and there was no expectation of trouble. But, switched on at the guest house, there was no sound from the loudspeaker to cheer the silence. We were miles from the nearest radio store and I had quite deliberately avoided bringing anything that vaguely resembled a spare component.

The tool kit in the car yielded a couple of screw drivers and we went to work with these. The audio end was dead, but there was plenty of spark between B-plus and chassis. At least we had high tension, and that was something!

One does not normally go round shorting the output plate to chassis but we did so in this case and the spark demonstrated that there was voltage also on the plate. A simultaneous thump in the loudspeaker indicated that the loudspeaker as well as the output transformer was in order—another comforting thought.

However, the grid and cathode of the output valve and the plate of the audio amplifier were all peculiarly unresponsive so that we began to suspect the output valve. It happened to be a type 42 and the two facts together pointed to an open cathode return.

CATHODE BREAK

If you look closely at a 42, or types of similar mechanical construction, you will see a fine metal strip welded to the bottom of the cathode sleeve and leading down to one of the wires coming up through the pinch. Apparently the slight expansion and contraction of the cathode, coupled perhaps with faulty welding during manufacture, breaks the junction with the cathode sleeve and renders the valve inoperative.

Suspecting this, I withdrew the 42 and held it up against the light. Sure enough, one could just see light between the two tiny parts which should have been joined. Now for emergency measures.

I wrapped the glass envelope in a handkerchief and struck the valve very firmly base down on the wooden table top. Object of this was to bump the cathode sleeve down a fraction so that it would bear against the loose contact ribbon. Of course, one may also bump the ribbon aside but there was nothing to lose in this case. After a second "bump" treatment the valve operated again and it continued to work for the rest of the holiday.

An open cathode lead is a fairly simple fault to pick with the aid of a multimeter—particularly when the output valve is concerned. The valve draws no current whatever from the power supply, so that the plate and screen voltages are much higher than normal—generally from 300 to 350 volts. No cathode bias is developed and a check in the cathode circuit reveals no current through the valve.

CURRENT CHECK

Provided the grid and cathode return circuits are in order, a normal valve simply must draw some current with such high plate and screen voltages. Check the solder joints carefully, inspect the socket contacts and resolder the base pins of the valve. If the trouble remains, it is pretty certain that the fault is in the valve itself—either an open circuit cathode or an open circuit screen. The valve checker will verify your findings.

Still in semi-personal vein, I walked in on an amateur friend the other evening and found him puzzling over a new transmitter. It happened to be one very similar to a "Radio and Hobbies" design, using a 6V6-G tritet driving an 807 final amplifier.

This may not appear to have much bearing on general service work, except that we will probably be seeing a lot of 807 valves in future equipment. As an aftermath of war conditions, these valves are selling at receiving type prices and may even make their appearance in branded receivers.

There is no need for me to repeat all that was said editorially in the March issue, except to mention again that a few simple precautions are necessary to ensure stable operation. This experience a couple of evenings ago underlined the matter in my own mind.

807 INSTABILITY

The transmitter in question was behaving very erratically. Sometimes the tritet would control matters but at other times the 807 would go off merrily on its own, not caring whether the crystal of the master oscillator was plugged in or not. It seemed a clear case for neutralisation—except that we knew full well that an 807 should not require neutralising. To act on the first impulse would not only have involved a lot of work but would clearly have been meeting one unnatural circumstance with another.

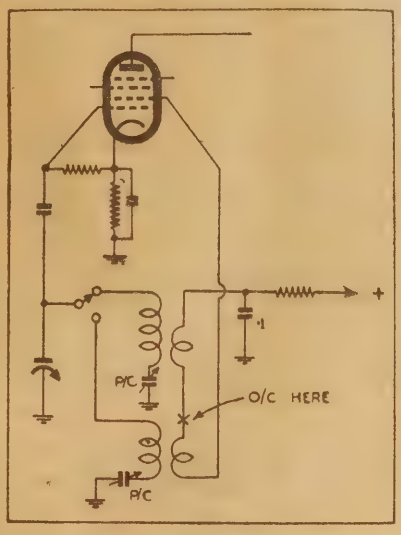
Reducing the number of turns on the small grid choke reduced the major oscillatory tendency but allowed the valve to go off into parasitic oscillation of a quite different character. The layout appeared to be good and a shield over the lower portion of the envelope did not assist.

One point we noticed was that our friend had used a 75 ohm solenoid wound resistor as the screen circuit suppressor, the only one on hand at the time. Without being optimistic, we replaced this with the recommended 100 ohm non-inductive type and the valve was immediately as docile as one could wish.

My amateur friend enjoyed his XYL's coffee much better as a result, but we made mental note for future occasions.

Just to round off, here are a couple of traps for the unwary, learned the hard way.

Mr. A. was an ardent but not very experienced home constructor, who



Showing where the break occured in the oscillator coil.

mounted the coils and IF transformers atop the chassis and then turned it over to make a careful job of the wiring. What he did not appreciate was the fact that the upturned chassis was resting on the core adjusting screws of the IF transformer—gadgets that are not always a model of ruggedness.

I.F. TROUBLE

The pressure soon pushed the screws hard down, stripping the thread in the moulding during the process. When the bewildered Mr. A. sought my help, I was able to patch things up a little but the adjustment of these two cores were for ever destined to be very sloppy and insecure. Other home constructors should take the hint and protect the slug screws while the chassis is upturned.

Another favorite trick of "butchering" is of course to turn a chassis over and allow it to rest back against the rectifier valve in the rear corner. The pressure will force the valve over at a crazy angle and spring all the socket contacts open, or it may snap off the locating pin on an octal base. Either way, prevention is better than cure.

SOME HINTS ON GRINDING CRYSTALS

Since the war ended, the radio amateur has been fortunate in securing from various sources many transmitting type crystals of fair to excellent quality. Some of these were previously used by our enemies.

UNFORTUNATELY, most of these crystals are on frequencies outside the limits of the amateur bands, thus calling for a session of grinding before they can be put to use.

During the past few months we have had occasion to grind down quite a few crystals of various types, and thought that a few hints on the job would not go astray. We don't suggest these hints cover all the tricks of the game, by any means, but we have managed to produce perfectly satisfactory "rocks" with very few failures, and can see no reason why others should not do the same.

EARLY FAULTS

Our failures—to the grand total of two—were the result of inexperience in the early stages. One was caused by trying to bring a crystal from about 3100 to 3600 without the use of a micrometer, with the result that we "lost" it, and ground it right through the band before getting it to oscillate again. The second was the first of the 7 mc. crystals, with which much the same thing happened, but this time due to inability to keep the blank flat enough. It came good at about 7800 kc. Oh, yes, another one broke in halves — always a risk even with the greatest care.

On the credit side are about half-a-dozen excellent 3.5 mc. crystals, and the same number of 7 mc type. As we had a good frequency meter on hand, accuracy was controllable to within about 500 cycles, generally less.

In grinding crystals there are certain items which are essential.

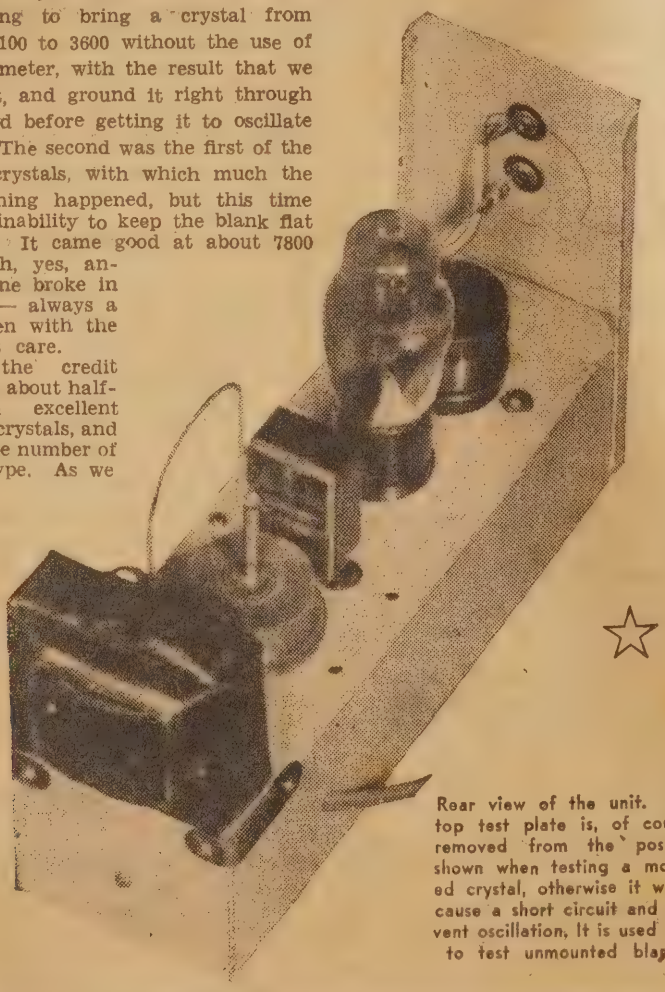
The first is a slab of old motor-car windscreen, or other section of plate-glass, necessary for its flat surface. On this glass the grinding will be done.

The second is some kind of test oscillator with which to check the crystal as grinding progresses.

The third is a micrometer, capable of reading to at least thousandths of an inch.

The fourth is a frequency meter to check frequency as you go along. If your receiver is accurately calibrated, and you are not fussy about putting your crystal accurately on one particular frequency, it will probably serve the purpose. If you use a receiver, be careful you don't take too many risks in grinding too close to the band limits. Few receivers are good enough to give you these limits "on the dot."

In addition to these, you will need carborundum grinding powder. If you use medium grade, you will find that it will do nicely for preliminary cutting as you approach your desired frequency, and will grind to a texture fine enough for finishing. If you like to be extra fussy, a little fine grade can be used for finishing, thus avoiding the risk of striking a spot of the coarser powder.



Rear view of the unit. The top test plate is, of course, removed from the position shown when testing a mounted crystal, otherwise it would cause a short circuit and prevent oscillation. It is used only to test unmounted blanks.

OSCILLATOR CIRCUIT

We have shown here the circuit of a simple crystal oscillator we have used for testing. It is a straightforward affair, and could well plug into the side of the receiver for its power supply. Almost any pentode valve will work OK, with no change in circuit constants. If a triode is used, ignore the screen connection. Any plate voltage between 100 and 250 will serve—we used an old power pack made by Philips which gives about 150 volts. The filament transformer we mounted on the little chassis merely because it was convenient to do so.

The chassis provides a standard crystal holder mounting plug, or you can use a 5-pin valve socket instead. In addition, we mounted an open type of "holder," consisting of a flat copper base plate and an upper plate connected to the grid with a flexible lead.

This latter is very handy for quick test of the blanks during grinding. It saves the trouble of inserting in a standard holder each time a test is required, with the risk of breakage and the loss of time. A couple of light plates can be made from two copper discs the size of a penny, ground flat on the glass plate and polished to a good, clean finish. Our plates were somewhat heavier than this, as we found them somewhat easier to handle when made that way. They are about ¼ of an inch thick and 2 inches in diameter.

THE COILS

Two plug-in coils were used, covering from about 3.1 mc. to 8.5 mc. The torch globe is lit from a two-turn link wound alongside each winding, and connected to two pins of the coil socket. The lamp is a good indicator of relative activity. A meter in the plate lead of the valve is also a help in indicating oscillation.

Before commencing any grinding, mark one surface of the crystal with a letter or number, so that you can identify it. Then grind only on the opposite side. The idea of a number or figure is so that you won't make an error because of the semi-transparent nature of the blank and grind

the wrong side. Renew this pencil mark frequently, as friction with your fingers tends to rub it off.

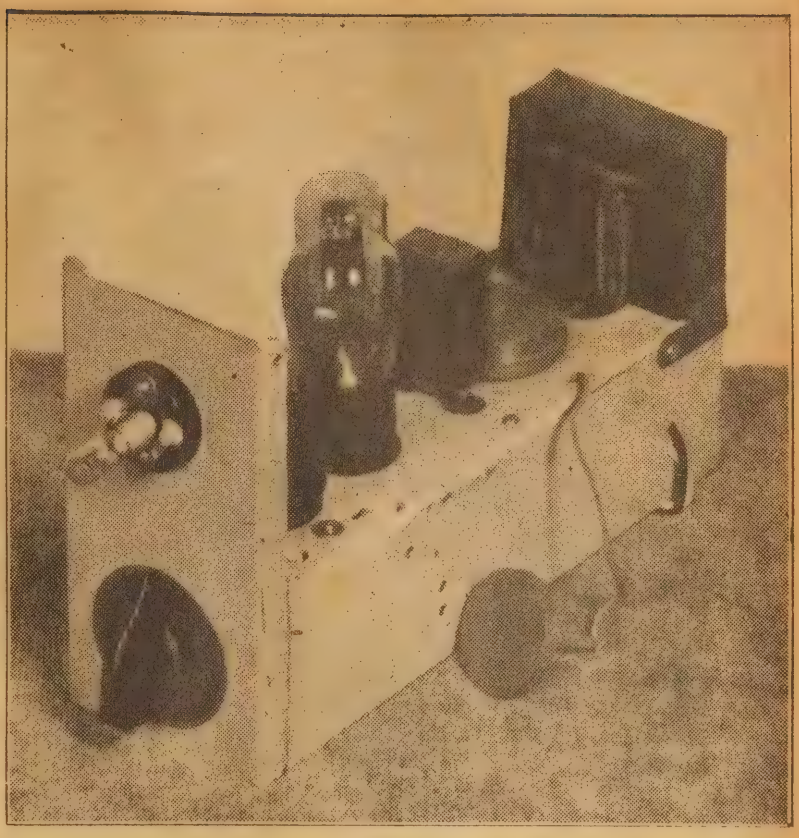
The actual grinding consists of first spreading a section of the glass with some grinding powder, mixed with water to form a slightly watery paste. Using very little more pressure than the weight of two fingers, grinding can take the form of the usual "figure eight" pattern, covering about four inches square to avoid grinding appreciable hollows on the glass.

FINGER PRESSURE

Our technique is to place the balls of the second and third fingers on opposite "quarters" of the crystal, keeping the fingers together and fairly flat, so as to distribute pressure as evenly as possible over the surface. After, say, four "figure eights," the crystal is turned so that the fingers are on the other two quarters. The effect is to keep the blank rotating every couple of "grinds," in an effort to keep the ground surface flat. Take every care to avoid pressing unevenly at any time. And don't rush things by pressing too hard. You are bound to get an uneven surface if you do.

After about 10 or 20 figure eights, lift the crystal up, rinse it clean in water, dry it, and test for frequency and oscillation. After a few rubs, it is possible that you will find oscillation has stopped. If so, run the micrometer carefully all over the surface until you find the high spot. This may be only a few ten-thousandths of an inch,

(Continued on Page 80)



Front view of the unit showing top plate of the test holder removed from the base plate. Other chassis layouts of course, can be used. This one happened to be handy.

The amplifier is built on a standard chassis which may be used for larger designs if required. It includes all the circuit features required to give the best possible results from the 807. It should appeal to many as a "rebuild" job when modernising an old circuit.

807 AMPLIFIER

One Valve—12 Watts

The new, low price of the 807, actually less than that of the 6V6, has completely altered our approach to audio amplifiers. It means that we can use this high powered valve at normal cost. This single ended design, for instance, will deliver up to 12 watts of excellent audio output, about the same as for push-pull 6V6's, and higher than 2A3's.

FED into a sensitive loudspeaker, this amount of audio power is more than ample for use in the home. On test, the original amplifier sounded awfully "loud and clear," even to our well-seasoned ears.

As we explained last month, the 807 is a transmitting version of the well-known 6L6 beam tube. The electrode structure remains substantially the same, but revised basing, a larger envelope and a top-cap plate connection allow it to operate with higher voltage and wattage ratings.

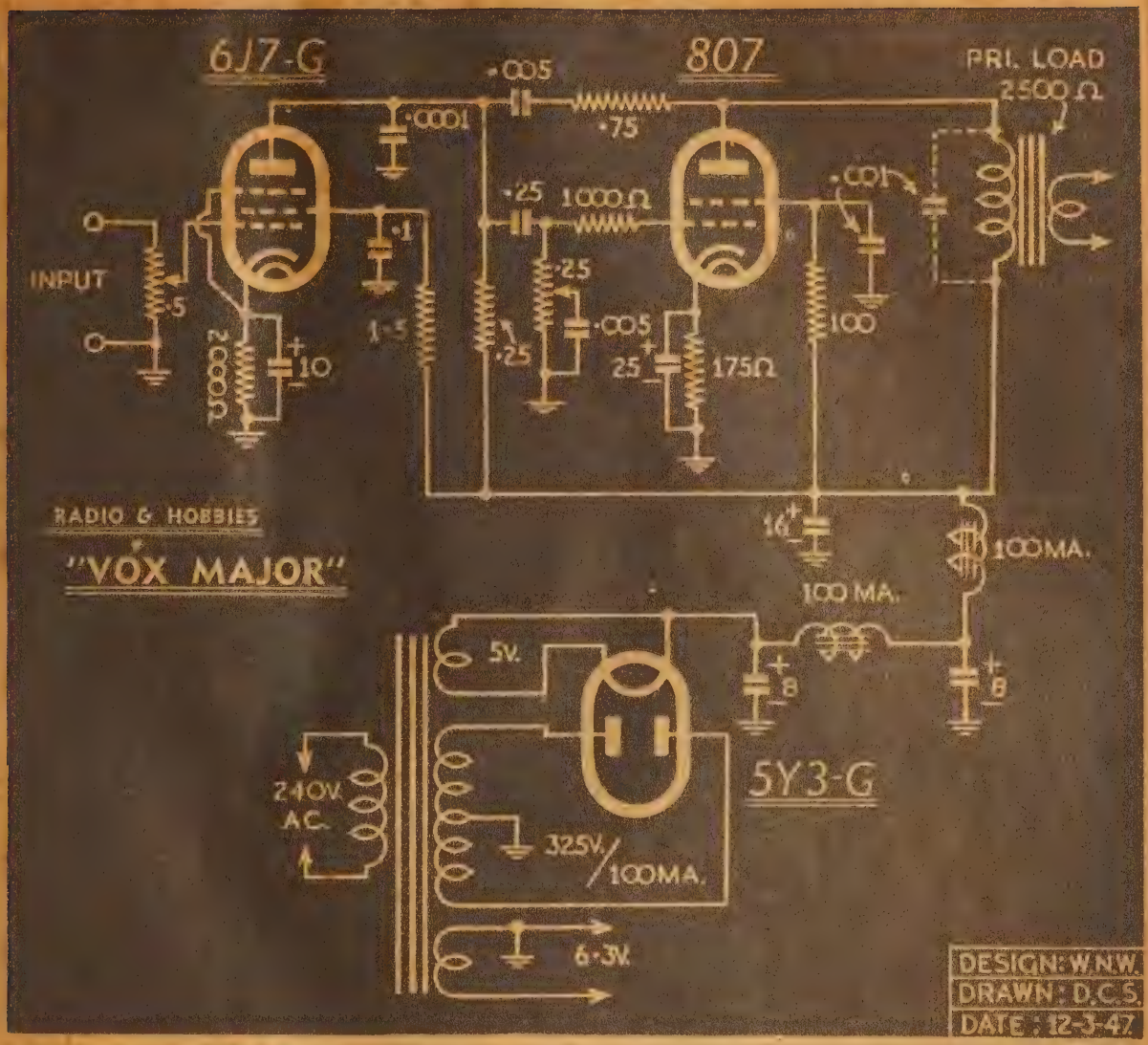
Even the original 6L6 was an impressive valve. As a single class A amplifier valve, one set of ratings show a power output of 10.8 watts—this with 350 watts on the plate, 250 on the screen and a fixed bias of —18 volts.

Unfortunately, these operating conditions are not as attractive as they might at first appear. The screen voltage must be stabilised at 250, and this means quite a heavy voltage divider system. And fixed bias is even more difficult to arrange, unless one resorts to the use of bias batteries. The nett result is that, by the time the circuit is arranged to satisfy the voltage ratings, the overall efficiency of the amplifier is very ordinary.

For the sake of simplicity, it is really feasible only to consider equal plate and screen voltage and cathode bias for a simple amplifier. Under these conditions the 6L6 was limited to a power output of 6.5 watts.

Expecting more of the 807, we set to work with the conversion factor curves and worked out new operating conditions for maximum power output under equal plate and screen voltages but still within the rating limits of the valve. It was found that a plate and screen voltage of about 285—with respect to cathode—would be permissible and that an output of 10 watts could be expected.

Knowing the operating currents, it was then a simple matter to run out a circuit utilising the valve under these conditions. The final circuit



The circuit has no surprises, but does include a "bass boost" feature as part and parcel of the feed-back circuit.

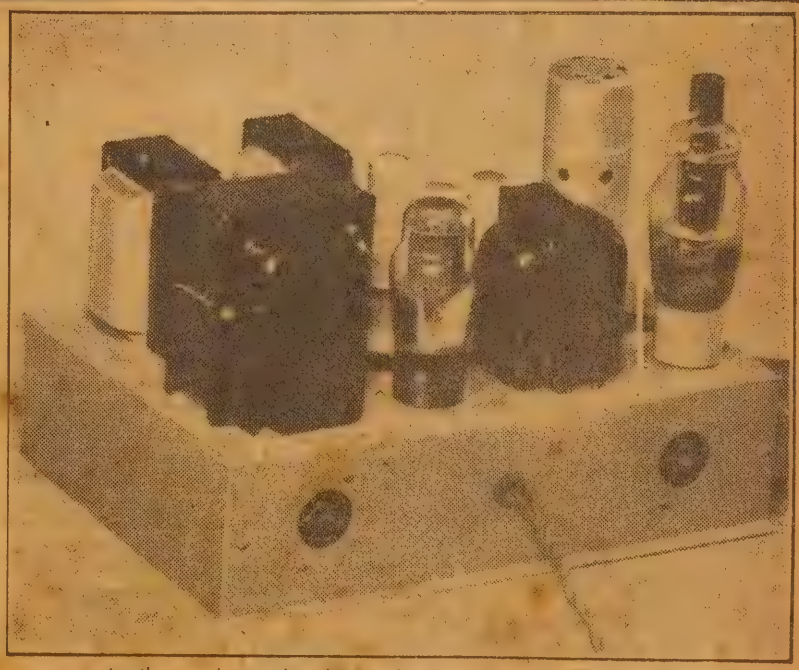
resembles very closely our "Vox Minor" amplifier of last year, so that the name was a natural choice — "Vox Major."

One immediate problem was that of a suitable chassis. The "Vox Minor" was built on one of the original "PA—" requirements for small amplifiers.

But it would have been a near impossible task to build the projected "Vox Major" on the small chassis, so that a new design was clearly indicated. We set to work with T-square and rule and the result of our labors is evident.

In line with present policy, the new chassis was not designed only with the "Vox Major" in mind. It is midway in size between the Little "PA—" chassis and those used for the 807 modulators, and has rather more area and more holes than would strictly have been necessary for this amplifier.

Mounting holes for four amplifying valves are ranged along the left-hand edge of the chassis, the output valves normally mounting at the rear. There



Another angle on the chassis, this time from the "business" end.

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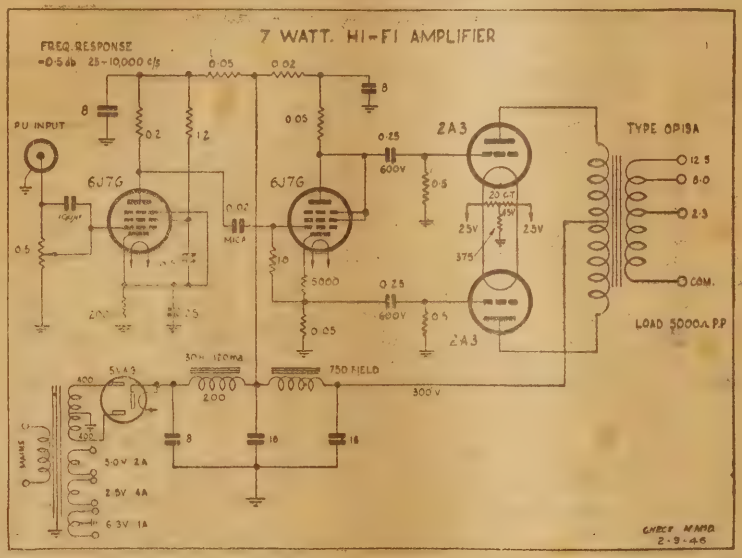

We have received numerous compliments from constructors of the 7 watt High Fidelity amplifier. Here is a letter from a Motion Picture Technician in a leading Sydney theatre.

COPY OF LETTER

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26 Mooramie Avenue.
Kensington, SYDNEY.

Dear Sir,

I wish to take this opportunity of expressing my complete satisfaction with your Fidelity 7 watt amplifier circuit as published by your company in recent trade papers.

I constructed this amplifier and used the transformer as specified by your circuit and believe me it has turned out a winner.

The amplifier has been in operation for several weeks now and during that time it has been heard by many interested people, all of whom have expressed their approval in no uncertain terms. They were particularly interested to hear that the transformer was made in Australia, and were unanimous in saying that they considered this a pretty good achievement, as undoubtedly the success of the amplifier is due in no small measure to the output transformer used, which certainly gave true Fidelity results.

May I add in passing that I am a Motion Picture Technician of some twenty years' experience and consider myself a very fair judge of sound. In my opinion this circuit of yours results in a really good true Fidelity amplifier.

Wishing your organisation continued success,
Yours faithfully,
(A. B. Morris).

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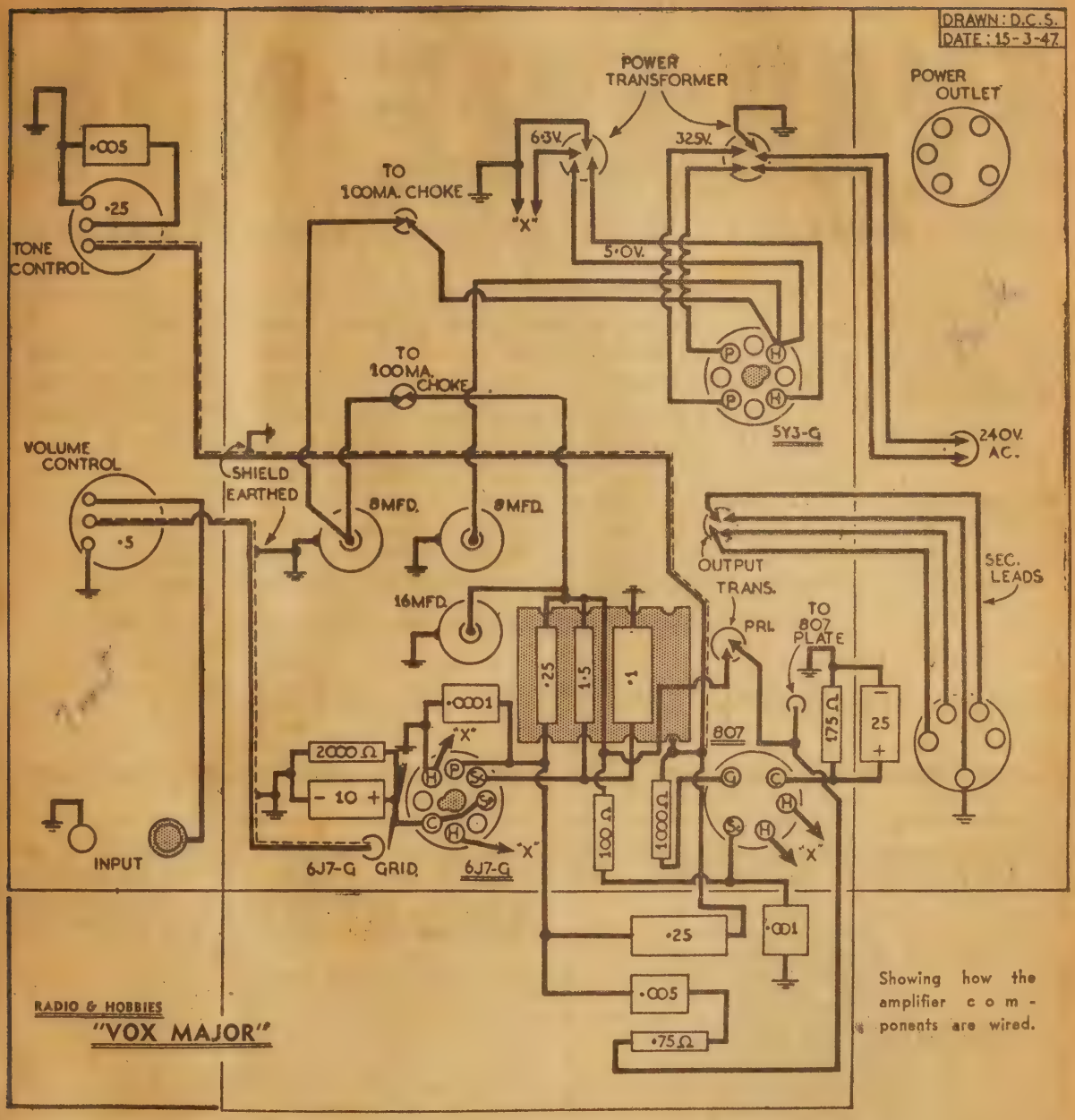

Showing how the amplifier components are wired.

is space between the rectifier socket and the other valve positions to mount either a push-pull input transformer or a large output transformer, whichever the circuit might require.

At the rear of the chassis are two more socket holes, one for the speaker and the other for use as a power output socket for a tuner, or other auxiliary apparatus.

On the front of the chassis, positions have been allowed for two volume controls with pickup and microphone terminals, and a tone control. Not all these may be required at the one time, but the general arrangement has proved very useful in the smaller "PA—" chassis.

Our own chassis was bent up and drilled in our workroom using sheet aluminium. The design will duly be passed on to chassis manufacturers, but blueprints will be available in the normal way for 2/6. We can foresee this chassis layout being used quite a lot in the coming months.

Reverting to the electrical circuit, the input is fed to a 0.5 megohm potentiometer. This is the optimum value for most crystal pickups and is suitable to follow most tuners. For a magnetic pickup a lower load is desirable and the potentiometer value can either be changed to .05 megohm, or a 0.1 meg. fixed resistor can be clipped across the input terminals with the pickup leads.

The sensitivity of the amplifier has been arranged so that full output is given with an input of just under 0.5 volt. The amplifier should therefore operate satisfactorily from any ordinary magnetic or crystal pickup, but it will not have enough gain to use with very low output types or with a microphone.

The first valve is a 6J7-G, operating under ordinary pentode conditions. This feeds through a coupling condenser to the grid of the 807. The circuit around this valve calls for some comment.

Past experience with 807 valves has demonstrated the desirability of keeping the grid circuit resistance to as low a figure as can be arranged, and we chose a value of 0.25 megohm for this amplifier. Use of this value makes it desirable to have at least a 0.1 mfd. coupling condenser—and it must be a good one. The first one we wired in proved to have a slight d-c leakage and applied sufficient positive voltage to the grid to upset partially the operating conditions. The one shown in the underneath photograph is a 600 volt can type which could be reckoned as being completely reliable.

The grid resistor is shown as a potentiometer for the purpose of tone control, a .005 mfd. condenser con-

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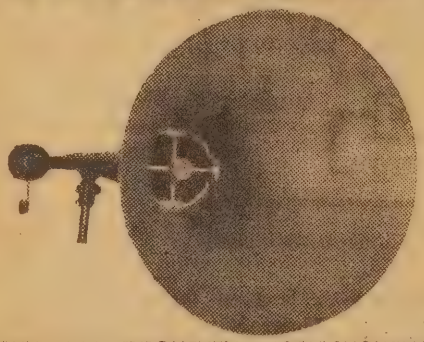

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necting between the moving arm and the earthed end. You can please yourself whether you incorporate this control, but we did so simply to anticipate the letters which would have come to hand asking how the additions could be made.

GRID SUPPRESSOR

A non-inductive 1000 ohm resistor is connected in series with the grid circuit and this should be connected direct to the grid pin as a precautionary measure against instability. A second non-inductive resistor—this time 100 ohms—should be connected in series with the screen supply, right at the screen pin, and bypassed to earth with a .001 mfd. mica condenser.

Bias is provided in the cathode circuit by a 175 ohm. 5-watt resistor and a 25 mfd. bypass condenser.

For negative feedback, we reverted to the same very simple scheme as was used in the "Vox Minor." We were tempted by other schemes involving feedback around both stages and also the output transformer, but there are uncertainties about these methods. They can be excellent but can also lead to trouble with instability if the constructor encounters an unfortunate combination of circuit constants, seen and unseen.

The feedback scheme involves basically a 0.75 megohm resistor connected directly between the two plates. The feedback operates at all frequencies and serves to level out the frequency response with reactive loading.

BASS BOOST

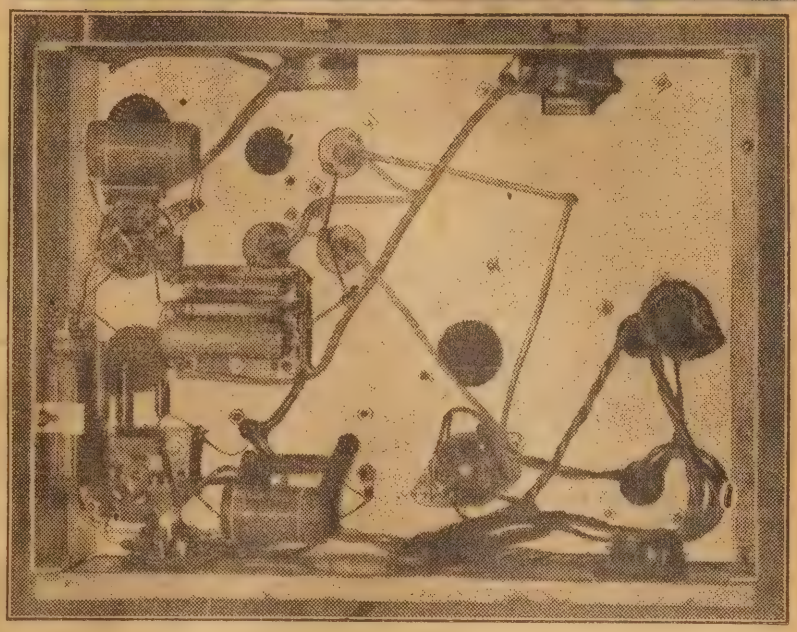
The extra "dodge" is the inclusion of a .005 mfd. condenser in series with the feedback resistor. This condenser increases reactance of the feedback line at low frequencies, reduces the feedback factor, and allows the gain to rise. It is possible by this means to produce a rising bass response, despite normal losses in the output transformer at low frequencies. The effect is valuable in this amplifier, where the output transformer has quite a job to do.

However, this also can be a matter of individual choice. Try the amplifier with the condenser in circuit, and note the general balance. If there is too much bass, omit the condenser and connect the resistor directly between the two plates. A larger value of condenser will confine the bass rise to the very low frequencies, while a smaller value will allow the rise to be evident further up the register.

OUTPUT TRANSFORMER

The matter of the output transformer calls for special comment. Operating under these conditions, the 807 draws a plate current of 80-odd milliamps, which tends to saturate the core. The usual loudspeaker input transformer, with limited core area, is hardly equal to the task, and the core saturation with consequently reduced inductance is likely to introduce distortion, loss of efficiency and lowered bass response.

AMPLIFIER UNDERCHASSIS VIEW



This photograph shows the underchassis of the amplifier.

This, indeed, is one of the drawbacks of a single-sided amplifier. With push-pull operation, the d-c plate current of the two valves tends to cancel out in its effect on the core, and it is a much simpler matter to obtain good efficiency and frequency response with a transformer of moderate dimensions.

Constructors who operate the 807 under full ratings are therefore well advised to purchase something more ambitious in the way of an output transformer. A good one will be just about as large as the power transformer, but you stand to gain almost two-to-one in increased efficiency.

POWER OUTPUT

Because of losses and mismatching, a poor transformer may deliver to the voice coil less than half the audio power which an amplifier is capable of delivering. In a good transformer, an efficiency of some 85 per cent. can be achieved.

With a resistive load across the primary, we measured just over 12 watts of audio power at overload point. At the secondary, one can expect anything from 5 to 10 watts, depending on the output transformer design. These figures naturally do not apply only to this type of amplifier; they are proportionately true of all others. The output valve in your receiver can deliver 4-odd watts of audio under ideal conditions, but you can rest assured that no more than 2 or 3 watts ever reaches the voice coil before overload point is reached.

However, that is rather by the way. Our best results were with an OP-1 locally-made transformer, which is a compromise between the ordinary loudspeaker transformer and a really expensive job. It has provision for three alternative voice coil impedances, which is a very handy feature, plus alternative 2500 and 5000 ohm primary loads.

Whatever transformer you use, it is a good plan to mount it directly on the chassis and thereby keep the 807 plate leads as short as possible. An 807 is likely to turn itself into a very effi-

PARTS LIST

1 Chassis, 12 x 8½ x 3in.
1 Power transformer, 325V. CT. 325V 6.3 at 3 amps.
2 High tension filter chokes, 100mA.
1 Valve shield.
2 Indicator plates "Volume" and "Tone."
1 Output transformer, 2500 ohm, primary. Sec. to suit speaker.

CONDENSERS

1 25 mfd, 40 P.V., 1 10 mfd, 40 P.V., 1 16 mfd, 525 P.V., 2 8 mfd, 525 P.V., 1 .25 mfd, tubular, 1 .1 mfd tubular, 2 .005 mfd. mica, 2 .001 mfd, mica, 1 .0001 mfd, mica.

RESISTORS

1 1.5 meg., 1 .75 meg., 1 .25 meg., 1 2000 ohm, 1 1000 ohm, 1 100 ohm, 1 175 ohm, W.W., 1 .5 meg., potentiometer, 1 .25 meg potentiometer.

SPEAKER: 1 10in. or 12in. permagnetic.

VALVES: 1 6J7-G, 1 807, 1 5Y3-G.

SUNDRIES: 2 octal sockets, 1 6-pin socket, 2 5-pin sockets, 2 knobs, 1 small grid clip, 1 large grid cap, 2 terminals, hook-up wire, shielded wire, spaghetti, power flex, nuts and bolts, etc.

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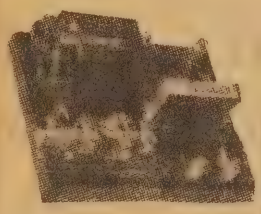

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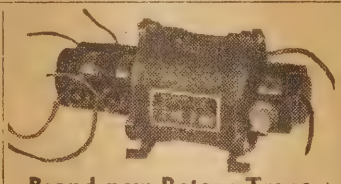

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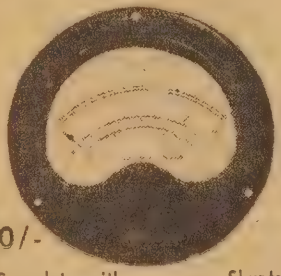

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cient R.F. oscillator if long plate leads are allowed to stray around the table or cabinet.

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The power supply calls for a two-section filter with plenty of henries and microfarads. You will find that a large single-ended amplifier calls for more care in the power supply design than a push-pull job, and there is no cheap way around it. Two 100 or 125 milliamp chokes are essential, plus three electrolytic condensers.

The final filter condenser should be 16 mfd. for preference and it is all to the good if it can be higher than this. It is effectively in series with the output load and a marked degenerative effect will be evident around and below 100 odd cycles if the capacitance is inadequate. This effect was quite marked when running the CRO over the original amplifier.

The choice of power transformer and rectifier will be influenced by what is available. The total current drain will vary from 90 to 100 milliamps for the two valves and our suggestion is a 325 volt 100 milliamp transformer with 5Y3-G rectifier.

FILTER CIRCUIT

If your transformer is rated at 300 volts, use a 5U4-G rectifier, or a 5V4-G with a 100 ohm, 3-watt resistor in series with each plate lead.

With a transformer rated at 285 volts per side you will need to use a 5V4-G rectifier to ensure full operating voltages on the 807.

With the 385 volt type of transformer, the filter circuit will need to have a d-c resistance of 500 ohms, odd to reduce the voltage to the correct figure. If the two chokes do not add up to this resistance, a heavy duty resistor will have to be connected in series with one of them.

Remember that you are aiming at a plate and screen voltage of about 285 with respect to cathode, or about 300 odd volts with respect to chassis. Operating voltages less than this will result in lower current drain and reduced power output. With an effective plate-to-cathode voltage of 250, an output of 6 odd watts can be expected.

The general layout of the amplifier is clear enough from the diagram and photographs, and assembly should present no great difficulty to the average constructor. A few odd holes may be necessary to adapt the layout for odd shaped chokes and transformers but a session with drill and file will correct this.

WIRING UP

The wiring is also fairly straightforward and there are no particular traps. Shield the "hot" lead from the input terminal to the potentiometer and from the potentiometer to the grid cap of the 6J7-G. The only other lead which needs to be shielded is the grid lead of the 807 running across to the tone control.

One final point. If the 807 shows signs of instability, try connecting a .001 mfd. condenser across the transformer primary, between plate of the output valve and B-plus.

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REACTION AND HOW TO CONTROL IT

Regeneration, or reaction as it is frequently called, is probably the most important single factor in obtaining results from simple receivers. With it, tremendous sensitivity is obtainable from a single valve. This article, which has been written mainly for the benefit of our younger readers, explains the methods of obtaining reaction, and outlines the features of each.

WITHOUT launching into a lengthy explanation, the term regeneration (or reaction) refers to the principle of feeding some of the signal voltage in the plate circuit of a valve back into the grid circuit to augment the original signal voltage. It is possible by this means to increase enormously the gain of a detector valve, so that the principle is almost invariably applied to small one to three valve sets. It is not used so much in larger sets, as adequate gain is obtained by using more stages of amplification.

The gain of a regenerative detector increases with the amount of feedback until a point is reached where the detector breaks into self-oscillation and begins to generate a radio frequency voltage of its own accord. When this happens, the locally generated signal beats with the incoming station signals and produces audible whistles in the output.

When receiving unmodulated code signals, this audible beat note is most useful, but it cannot be tolerated as a background to speech or music. The detector must, therefore, be operated for maximum efficiency just below the point of oscillation, and the adjustment of the reaction control to this point is generally quite a critical one.

IMPORTANCE OF SMOOTH CONTROL

It is most important that a regenerative detector should approach the point of oscillation smoothly as the control is advanced. A common fault is for the detector to begin oscillating with a loud "plop," which is not only unpleasant to the listener, but prevents the detector from ever being operated right at the point of oscillation.

Yet another common failing is for the receiver to break into a loud squeal near the point of oscillation. This is quite distinct from the variable heterodyne whistle produced by beating with the incoming carrier. More piercing in character, the howl is closely related to audio instability and is generally referred to as "fringe" howl.

A third and most annoying failing of some regenerative detectors is the tendency to commence oscillation and cease oscillation at different points when the control is turned in opposite directions.

When advancing the control, the listener may turn it up a fraction too far and cause the detector to oscillate. Backing it off again, it is found that the detector does not cease oscillating at the same spot on the control.

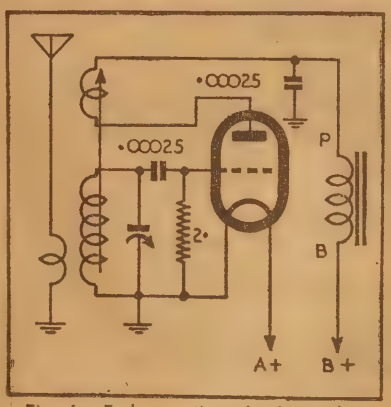


Fig. 1.—Early reaction circuit employing variable coupling between coils.

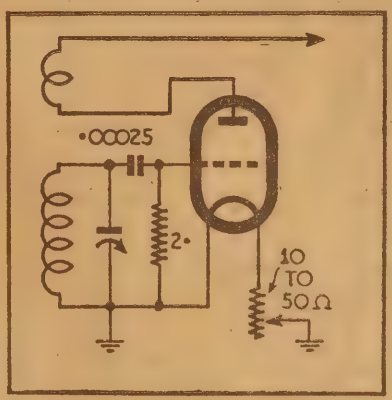


Fig. 2—Another early circuit used a rheostat to vary filament temperature and emission.

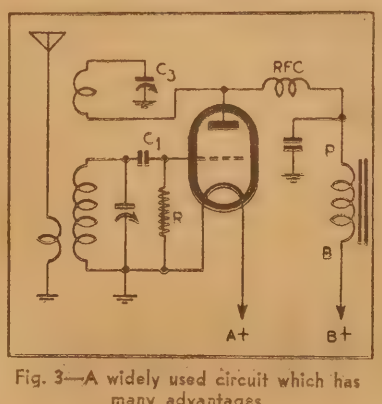


Fig. 3—A widely used circuit which has many advantages.

When it does go out of oscillation the sensitivity is not at its peak and the control has to be edged forward again. This lag effect is most disconcerting, particularly where it is essential to get the very best out of the detector.

Some detuning of a regenerative detector is generally evident as the reaction control is advanced to the point of oscillation. The effect is dependent to a certain extent on the physical arrangement of the coil windings and the details of the circuit. However, much of it is due to electronic effects within the valve itself, arising from the variation in gain as the reaction control is adjusted.

The factors governing the behavior of a regenerative detector are many, and the beginner cannot hope to analyse each circuit and correct troubles from a purely theoretical viewpoint. Because of more or less random factors, one type of reaction circuit may be preferable in a particular receiver, but operate to less advantage in another.

SOME TYPICAL CIRCUITS

It is well, therefore, for the experimenter to keep an open mind on the subject, avoiding obvious pitfalls, but nevertheless using the type of circuit which gives the best results in his particular case. To provide a basis for experiment, we have set out a variety of reaction circuits with comments about each.

Figure 1 depicts an early type of reaction circuit, common in the days when honeycomb tuning coils were mounted on the front of the receiver panel. Signal currents from the plate flow through a so-called "tickler" coil which is inductively coupled to the grid coil. Some of the energy in the plate circuit is therefore coupled back into the grid circuit.

The arrow through the two coils indicates that the coupling between them is variable. The usual arrangement was to have the reaction coil pivoted so that it could be moved towards or away from the grid coil, as necessary.

Although the method is quite workable, a fine control over the reaction is difficult to obtain. Furthermore, the type of honeycomb or basket weave coils employed are no longer in fashion.

FILAMENT VOLTAGE

Another circuit which was popular a few years ago is depicted in Figure 2. Here the degree of reaction is controlled by a rheostat varying the temperature (and therefore the emission) of the filament. There is no need for the positions of the coil windings to be variable, although rheostat control was often utilised in early sets in conjunction with a swinging tickler coil.

Perhaps the main difficulty abou the method is the apparent lag whic is evident in the effect of the contro Changing its setting slightly will var the voltage applied to the filamen but it takes measurable time for th filament to assume a new operatin temperature.

The resistance of the series rheosta must suit the filament rating if a adequate degree of control is to b obtained. With a very heavy curren filament—like that of the old 201-A— a rheostat of 15 or 20 ohms will giv adequate control, but, for lighter fila ments, values of from 30 to 50 ohm are necessary.

POPULAR CIRCUIT

The circuit shown in Figure 3 i probably the most widely used now adays and deserves special attentior

The plate of the detector is fe from B-plus through an RF chok and the primary of the transforme —or plate load resistor—as the cas may be. A separate lead goes t the reaction coil, which is inductive ly coupled to the grid coil. An im portant difference is that the coil i returned to earth through a variabl series condenser.

The intensity of the signal curren through the reaction coil is depend ent on the capacitance of the reactio condenser C3. The greater its capa citance, the more energy is fed back

In this reaction circuit, as in a others, the phase relationship of th reaction and grid windings is import ant. Connected one way, the energ fed back into the grid coil adds to th signal voltage, producing a regenera tive effect. The other way, th energy is fed back out of phase wit the original signal voltage and there fore subtracts from it.

Connections to commercial coils ar usually marked, but a simple rul allows one to ascertain the correc connections for home-wound solenoi coils.

If the grid and reaction winding are wound on in the same direction the grid and the plate must connec to opposite ends of their respectiv windings. Assuming that the grid i connected to the top of its windin then the plate must connect to th bottom of the reaction winding.

COIL WINDINGS

When the coils are wound on to th former in the opposite direction, the grid and plate connect to the sam ends of the respective windings. Thes remarks apply, irrespective of the re lative positions of the two windings.

The reaction winding is usuall placed just clear of the grid end o the secondary and wound in the sam direction. This leaves the earthe end of the secondary free for the addi tion of an input aerial or plate winc ing. Nevertheless, specifications some times require the reaction winding t be at the earthed end of the grid coi Or alternatively, the reaction windin may be reversed in direction and it stalled at either end of the grid coi

As a rule, these variations represe the whims of the person who designi

he set in the first place, rather than ny special technical principle. For econdary reasons, one arrangement r the other may prove to have a light advantage in a particular set, o that time spent trying out various inding arrangements may yield improved results.

If, for any particular connection, the eaction does not appear to be functioning, try reversing the connections o the reaction winding, as it is easy o become confused.

Coming back to Figure 3, the usual apacitance value for C3 is 100 mmfd. value lower than this cannot be elied upon to give adequate feedback, hile higher value condensers may be nduly critical in their adjustment.

Very obviously condenser C3 will ave a certain minimum and maxium capacitance, so that the reaction inding must be of such a size and o coupled to the grid coil that it prouces a suitable amount of feedback. he valve, too, has a bearing on the natter, as some types oscillate more eadily than others.

EACTION COUPLING

If the reaction winding is much too rge or too tightly coupled, then osllation may be apparent over porion of the tuning range, even with C3 minimum capacitance setting. Conersely, a too small reaction winding ould not produce oscillation over the ning range, even with C3 at maxium capacitance.

The coil specifications for particur sets usually cover this circumance by denoting the optimum design r the reaction winding. Where ecifications are indefinite, or where ctual difficulty occurs, an appreciaon of the above statements will allow ie adjustment to be made to the size the winding.

Uncontrollable oscillation generally lls for a reduction in the number reaction turns, while inadequate eaction calls for more turns. Howver, never add turns without first reersing the connections to see that the ase relationship is not wrong.

Quite apart from actual variation the reaction winding, some adjustent is possible by varying operating nditions of the detector. For example, o fierce reaction can often be amed" by inserting a rheostat in ie filament circuit to reduce the fila-ent voltage.

Again, the detector plate is usually erated with an effective voltage of tween 20 and 50 volts. By increasg the operating voltage within these proximate limits, more reaction is tained. A reduction in plate voltge reduces the tendency to oscillate.

ARYING HIGH TENSION

Where the plate is fed through the mparatively low resistance of a ansformer winding, the desired reults can be obtained simply by shiftg the tapping on the high tension pply up or down as necessary.

Alternatively, the detector is often pplied from the full high tension voltge through a plate load resistor. In is case, decreasing the value of the ad resistor will increase the effective plate voltage, and vice versa. But it is not wise to vary the value too drastically from the originally specified figure, as the performance of the set may be compromised in other directions.

Another point of interest is the R.F. choke inserted between the plate of the valve and the load transformer—or resistor as the case may be. Its purpose in life is to prevent the R.F. energy in the plate circuit being bypassed straight to ground through the capacitive qualities of the audio output circuit. A poor choke will not do this effectively, so that only a small proportion of the plate circuit energy is effective in the reaction winding.

Ordinary single pie honeycomb

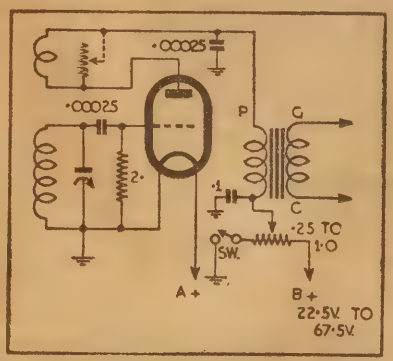


Fig. 4—Reaction is obtained here by varying plate voltage of the detector.

wound chokes are usually adequate for broadcast band operation, but more elaborate multi-pie chokes are sometimes desirable or even essential for regenerative detectors used on the short-wave bands. In cases of doubt, a choke can be demonstrated to be inadequate if more reaction is evident with a 10,000 ohm carbon resistor in series with the choke or simply in place of it.

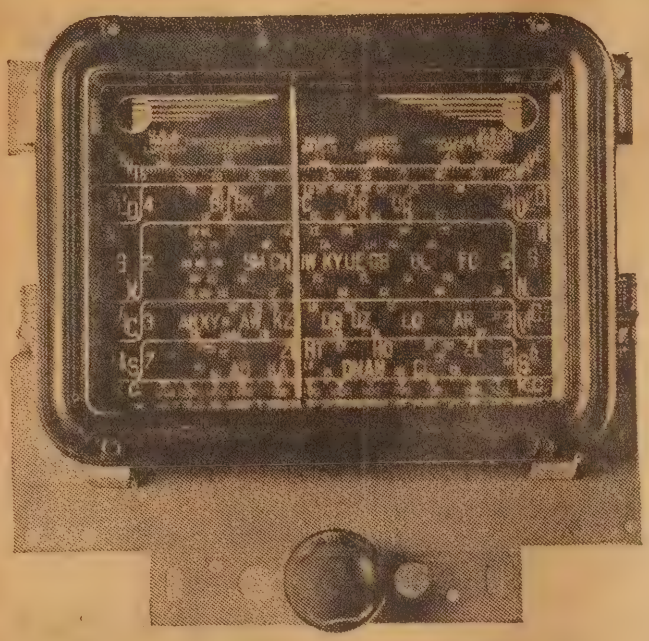
The condenser C2 serves to eliminate the high frequency signal voltage from the audio output circuit, and its inclusion is often an important item in the elimination of ploppiness or the fringe howl referred to earlier. The usual value for C2 is 250 mmfd., although it may vary in practice from 100 to 500 mmfd.

GRID LEAK

The values of C1 and R are also worthy of attention in case of trouble. Resistor R may be anything from 0.5 to 5 megohms, usual values being either 1 or 2 megohms. For C1, the values specified vary from 100 to 500 mmfd., the usual values being either 100 or 250 mmfd. No general rules can be made about these components. It is simply a matter of trying out values in individual sets and selecting the combination which gives best results.

Although referred here particularly to figure 3, most of the foregoing remarks apply to the other reaction circuits here described.

Figure 4 is a widely used circuit arrangement in which the regeneration is controlled by varying the detector plate voltage. The control potentiometer is generally of a re-



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istance between 0.25 and 1.0 megohm

The usual procedure in adjusting he circuit is to supply the positive end of the potentiometer from a voltage source just high enough to ensure oscillation of the detector over the whole of the tuning range, with the control set to the position of minimum series resistance. Turning the control back increases the resistance in series with the detector plate circuit, lowers the effective plate voltage and brings the valve below the point of oscillation.

Smoothest control is obtained when he potentiometer value is as low as possible consistent with adequate control effect. Too high a resistance limits he range of movement and renders operation of the control unduly critical.

It often happens, however, that even he full resistance of a 1.0 megohm potentiometer in series with the plate supply will not sufficiently reduce the plate voltage to prevent oscillation. This is particularly likely to occur when he detector of necessity has to be operated from a potential of 60 or more volts—as from an untapped B-battery.

POTENTIOMETER CONTROL

When this happens, it is necessary o earth the free end of the potentiometer so that the plate voltage can be reduced as near to zero as is necessary o obtain complete control over oscillation. There is a certain amount of "bleed" current through the potentiometer, but with values over about 0.25 megohm this is so small as to be of no consequence.

However, where the high tension supply is derived from batteries, the small bleed current must not be allowed to flow during periods when the set is not in use.

Thus, the circuit through the potentiometer must be broken, either by installing a switch to break the earth return, as shown dotted, or by disconnecting the B-batteries when the set is not in use. The usual plan is to use a double pole "off-on" switch, one section switching the filament circuit and the other the earth return through the potentiometer.

Another point about this circuit worth noting is the necessity for bypassing the junction of the control potentiometer and the audio load—transformer or earphones, as the case may be. The condenser should have a capacitance of at least 0.1 mfd., since it forms the return path for the audio signals back to earth. It also prevents noise occurring in the output of the set due to imperfections in the potentiometer resistance element.

ADVANTAGES

A particular advantage of the potentiometer method is that it will control reaction adequately even if the reaction coil is too large or too closely coupled. However, it is not wise to take liberties with this property, as the coil may suffer for other reasons if the coil design makes it necessary to operate the detector with an unduly low plate voltage.

(Continued on Page 63).

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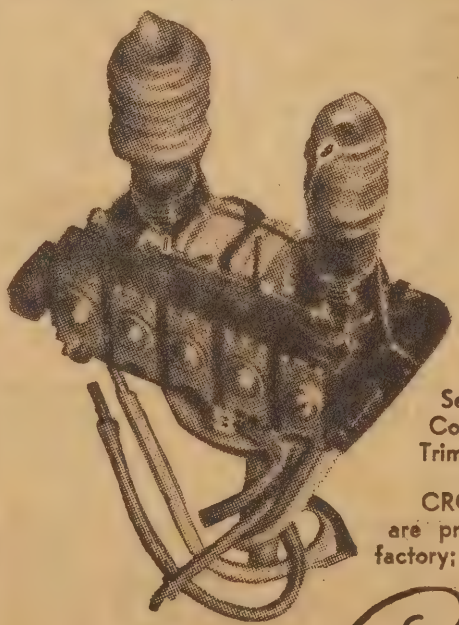

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Gadgets and circuits which we have not actually tried out, but published for the general interest of beginners and experimenters.

Here is a project which will be of interest to many home constructors. Built up around an ordinary hand drill this device will enable you to wind up quite passable honeycomb coils and R.F. chokes. A little ingenuity is required, but the drawings below show fairly clearly just how it is put together.

THE coil winder is made up from a small hand drill and a base of ood is required to mount the drill n. A bracket made of aluminium or on is fastened between the wooden andle and the gear drive and screwd to the base. Then a piece of wood fixed to the handle and screwed the wooden base and the two should old the drill quite firm.

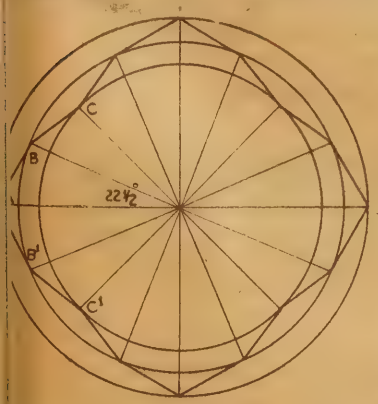
A cam must be made and the drawgs show how this is accomplished. he cam on the original was cut from -16th inch red fibre.

Different types of drills may require ifferent treatment in attaching the am. There should be no undue difficulties, however, but the size of the am will be determined by the method attachment. The main points are at the cam must be centred corectly so that the lift and drop will e the same at all points of the cam; econdly that the rocker arm will not ul other parts when operating.

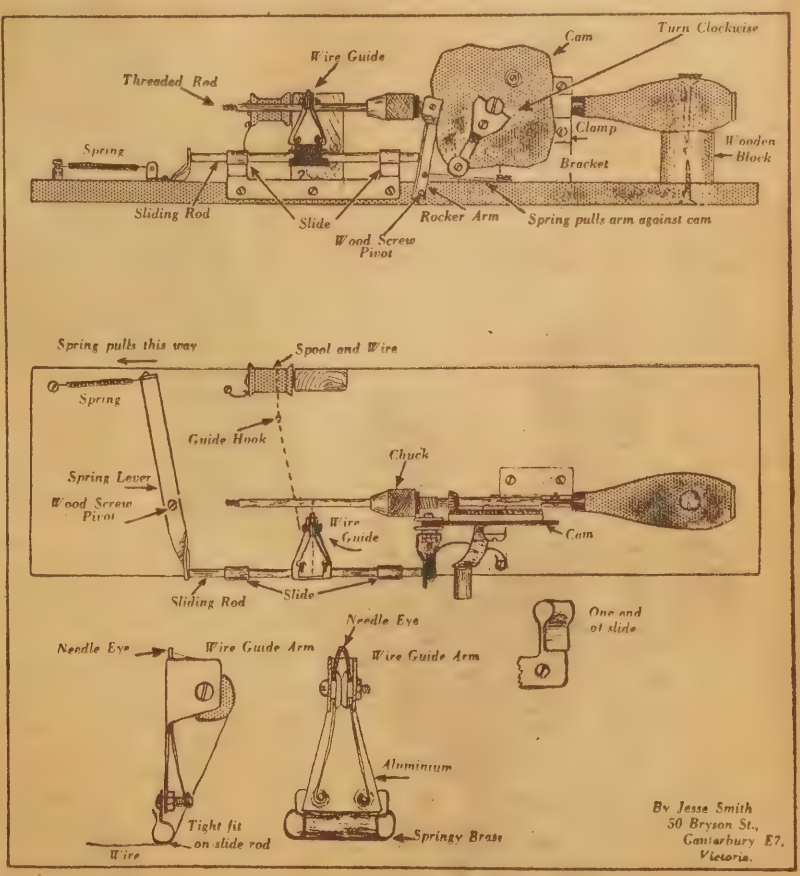
It may be necessary to attach a new andle and a hole may have to be rilled in the large gear to secure this d to hold the cam; die-cast gears cast iron gears drill through very sily.

Next construct the slide mechanism, acing the piece of steel or brass rod that it protrudes from each end out one inch. The rod must be free slide easily but must not be too ose.

The rocker arm comes next and this made from a piece of mild steel, formed into an angle shape on the vice. On the end of the rocker arm a hole is drilled to take an eighth inch bolt and the necessary washers — two large washers with a smaller one in the middle for the cam to engage on. The large washers prevent the cam from slipping off. Drill two more holes at the bottom of the rocker arm, one for the pivot screw and one to take the spring.



This diagram shows you how to shape the cam which drives the rocker arm guiding the wire. The depth of the cuts governs width of the finished dies.



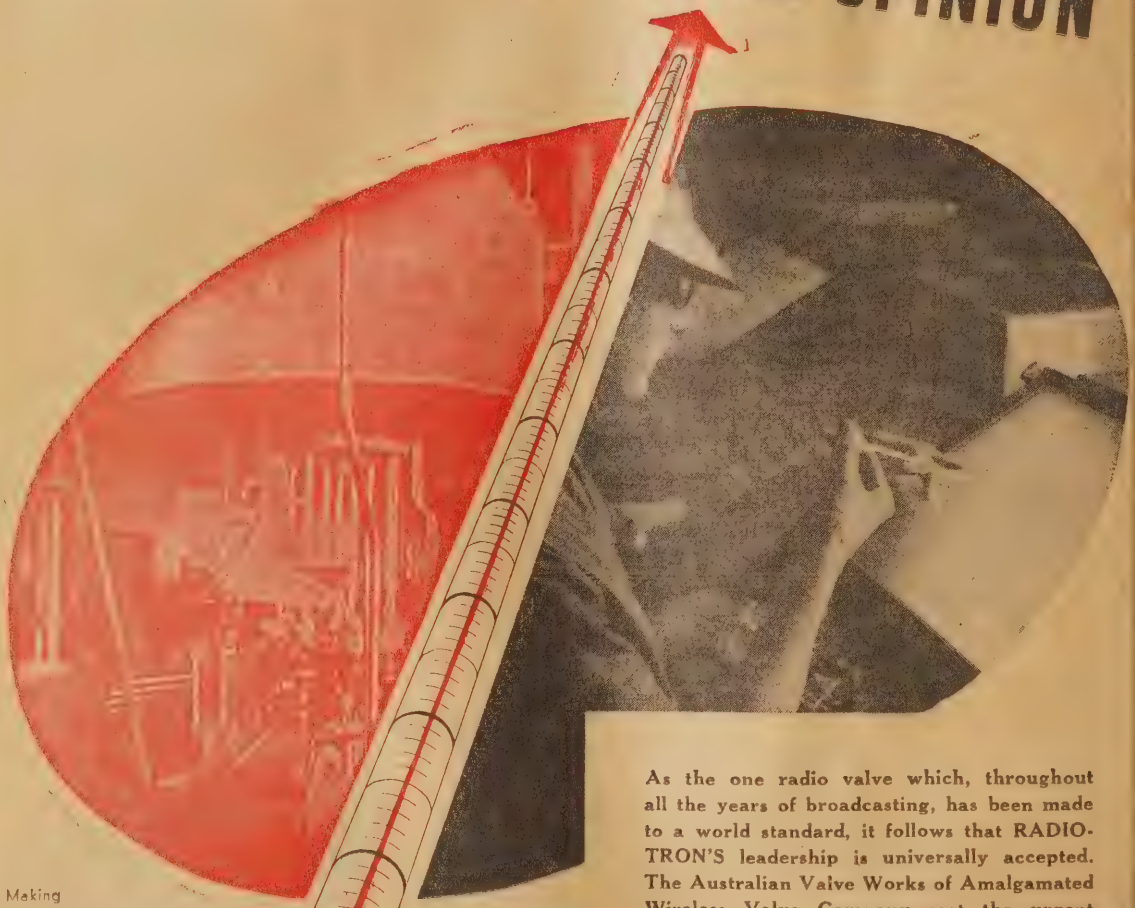
Next make the wire guide from a piece of aluminium and some spring brass. The top end is made in the form of a U, and a pulley is secured held by a small bolt. The pulley does not revolve but serves to locate the wire. A loop is necessary below the pulley to lead the wire on to it. The ends of the aluminium are held by two bolts to the springy brass, which is bent to grip the slide rod.

Another lever is required, as per the drawing, and a coil spring. Having made all the bits and pieces assemble the cam on the gear of the drill. A new handle may have to be made to operate the drill and this can be fashioned from iron, thick aluminium or dural.

Screw down the rocker arm in such a position that it is vertical when the cam is at the centre of its movement. Now the slide arm with the wire guide can be screwed down and finally the lever with its coil spring. A piece of clock spring is required to hold the rocker arm against the cam and this is also placed in position. The wire guide affixed to the slide rod should be free to move to and away from the drill chuck quite easily. A little oil on the moving parts should improve the operation greatly.

A piece of rod screwed at one end and about 3in. long is required to hold the coil former in the chuck and a nut

THE BAROMETER OF WORLD OPINION



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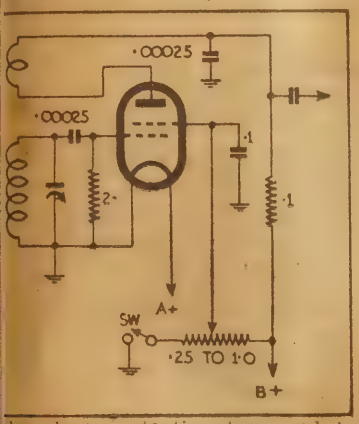
REACTION CONTROL

(Continued from Page 59)

As an alternative to controlling the high-tension voltage, it is possible to connect a potentiometer in parallel with the reaction coil, as shown dotted in figure 4. A value of from 400 to 1000 ohms is usually employed, and, in the maximum resistance position, it allows the reaction winding to promote oscillation in the usual way. However, turning it in the opposite direction shorts out the reaction winding, reduces its effect, and therefore yields some control over the regeneration.

The method is not often used, as it is inclined to be noisy with other than



the best potentiometers, and hand capacity effects may be evident. If the spindle of the potentiometer is not insulated from the element—and it seldom is with these values—the spindle should be on the load side of the winding.

(To be Continued)

A READER BUILT IT

(Continued from Previous Page)

and washer on this serves to hold the coil former in place.

Before fixing on a coil former place a soft rubber grommet on the rod, next the coil former and again a rubber grommet, then the washer and lastly the nut. Check it for true running. A support for the wire spool is required and a hook on the baseboard to guide the wire.

Having placed the coil former in position and the spool of wire, guide the end of wire through the hook and bring it up round the bottom of the wire guide arm, over the pulley and through the needle eye guide. Wind it round the coil former a couple of times and pull it tight between the rubber grommet and chuck. All is now ready to wind an RF choke.

As the ratio of the drill gears usually is 3½in. it means we wind 3½ turns each time we rotate the handle. So if we turn the handle ten times we get 10 x 3.5 or 35 turns. It is easy to count the turns this way.

When one pie has been wound with the required number of turns, wax the end down and then carefully push the wire guide arm along the rod the required distance and continue. Several pies can be made in this way. When you reach the end, wax again and then cut the wire. Loosen the nut on the coil former holding rod and remove your coil.

PHASING TRANSFORMER WINDINGS

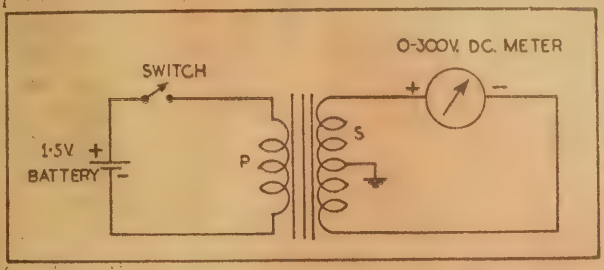
Last month we published in these pages a brief article explaining how radio power transformers can be connected in parallel. A letter to hand from one of our readers points out that the method is unsuitable for transformers larger than ordinary radio types and sets out an altenative method by which the job can be done:—

I WOULD like to offer an alternative method of testing for phase rotation. I have used the method many times in tests for "polarity" in current transformers where the phase rotation is very important in regard to energy or kilowatt hour meters.

"Phasing out" by the method given in the article on parallel operation of two transformers in the February issue would be impossible with large transformers, due to the very low impedance of the windings. Under these conditions electrical and mechanical stresses are set up under short circuit, which even though of brief duration, could easily cause breakdown of inter-turn or layer insulation and collapsing of the coils in some cases.

A reference to the diagram will show how the phase rotation test is made. A battery of 1.5 volts is connected through to switch to the primary of the transformer. Between one side of the H.T. and the other side a moving coil volt meter capable of reading 300 volts is connected.

On closing the switch an instantaneous voltage will register on the meter. If the meter reads forward, the H.T. terminal to which the POSITIVE terminal of the meter is connected will bear the same phase relationship to the primary terminal, which is connected to the POSITIVE terminal of the battery. In this case the two terminals are said to be positive and are appropriately marked.

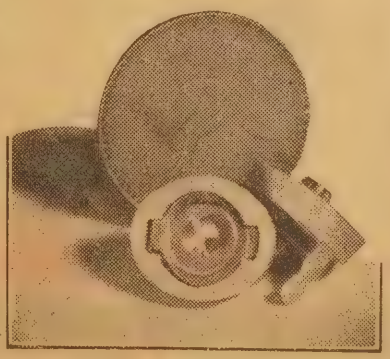


This operation must be carried out on each transformer to be paralled, and then the corresponding terminals may be joined without any fear of internal shorting.

Care must also be taken to see that the A.C. mains are connected to the transformers in the same relationship, otherwise the work involved in phasing out will be of no avail.

From Gordon I. Janson, 9 Jubilee Street, Wahroonga, NSW.

NEW TRIMMER CONDENSERS



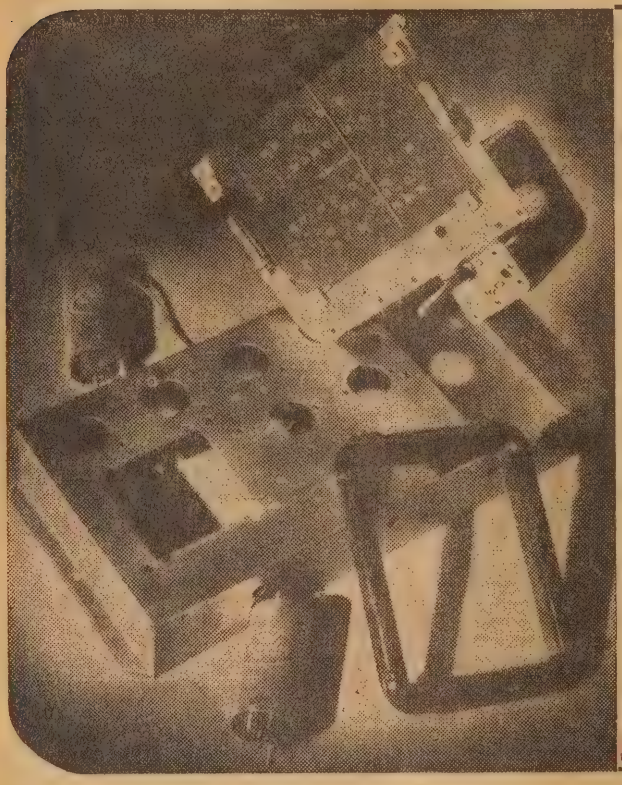
SMALL in size and easy to mount, a line of trimmer condensers now on the market is finding wide use by large scale manufacturers. Altogether something like 25,000 of these condensers have been distributed since their release in November last.

The trimmers, which are shown here in actual size, are assembled on a moulded mica filled base. The bottom plate is of brass and the top plate nickel steel, arched to provide a positive compression action. The adjusting screw passes through the two plates, operating in a nut on the reverse side of the trimmer.

The trimmer is normally mounted by its lugs directly in the wiring, its moderate weight making this scheme quite reliable. Supplies are available through all distributors.

KKI

THIS IS THE FAMOUS FERROTUNE FOUNDATION KIT



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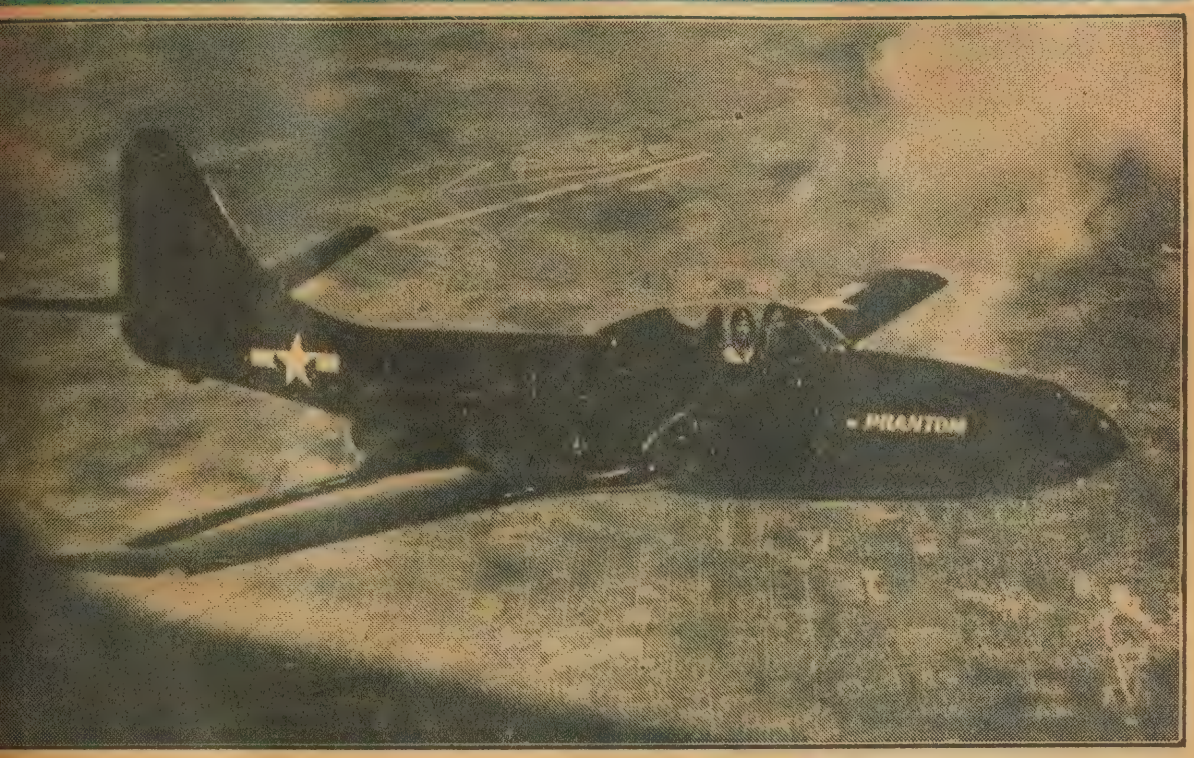
TWIN-JET FIGHTER FOR U.S. NAVY



A photograph of the Phantom taken in flight.

First demonstration of the ability of American Navy twin jet-propelled fighter to operate from a carrier at sea, scored several points for the McDonnell XFD-1 Phantom and probably put a final damper on further development of conventional-powered navy carrier fighters. Details of the aircraft and its performance are given below.

by

Boris Carone

DEMONSTRATED clearly were two expected points of jet-propelled ghter superiority—much higher speeds nd rapid warm-up. (Take-offs were ade two minutes after engines tarted.)

The XFD-1 also clearly showed it ossessed good stability at relatively w speeds, that it could take a "wave-ff" in its stride, and that it could ecome airborne in runs of less than 00ft.

The five-ton Phantom, powered by wo Westinghouse 19B axial-flow turbo-et engines, made five successful take-ffs and landings aboard the giant 0,000-ton carrier Franklin D. Roose-elt, 35 miles at sea off the Virginia apes.

The XFD-1 consistently was airborne fter runs of less than 400ft., less than 0 per cent. of the available flight deck.

The take-offs were made with the ranklin D. Roosevelt steaming at 20 nots into a 15-knot wind.

Lieut.-Commander James Davidson as the test pilot.

It was disclosed that the Navy ureau of Aeronautics, piloted aircraft ection, also has a number of other rbo-jet fighters under development, including the McDonnell XF2D-1, powered by considerably larger engines than the Phantom.

More than a dozen new planes, both Army and Navy, are now under development, which use Westinghouse designed axial-flow turbo-jet engines, including a new and more powerful engine now being tested.

While only the XFD-1 prototype is at present flying, orders for two groups of Phantom fighters (approximately 50 planes) are now in process of construction at the St. Louis plant of McDonnel Aircraft Corporation.

They will be powered with production Westinghouse 19B engines, developing about 1600lb. thrust.

Only about 1280lb. thrust from each engine was used in the XFD-1 carrier tests to keep the turbine temperatures within completely safe limits, although the engines are designed to operate up to 1360lb.

Turbines are operated at 15 to 18,000 rpm in flight, with temperatures as high as 1200deg. F. at the turbine buckets.

The plane flew at a weight of 8800lb., with fuel replaced after each flight to maintain as near constant weight as possible.

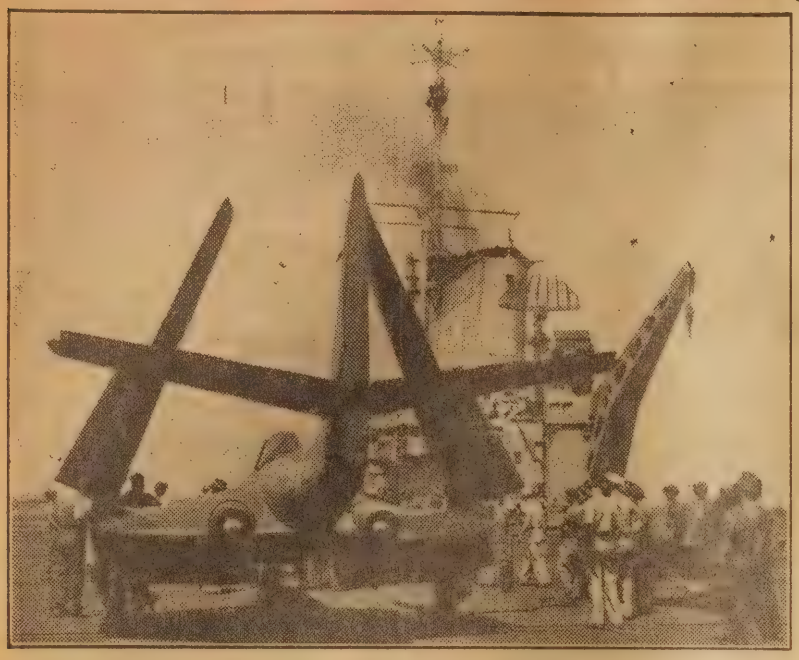
Aviation gasoline was used, to eliminate need for a special supply of kerosene.

While the high-octane aviation gasoline which is standard carrier fuel has leaded and aromatic constituents which make it less desirable for long periods of turbo-jet operation, there is little difference in performance when it or kerosene is used.

The principal problem of jet-type carrier fighter design is not one of short take-off characteristics, but a problem of stability and control at slow speeds.

The Bureau of Aeronautics has performed extensive tests on the Bell P-59A Airacomet and the Lockheed P-80A Shooting Star, and, although both are successful turbo-jet designs

FIGHTER PLANE GOES TO BED



This picture shows how the wings are folded in preparation for its journey below decks.

with the latter showing extremely high maximum speed at altitudes, neither was programmed for carrier tests, due to lack of satisfactory stability at speeds below 125 mph.

Commander Davidson, who has flown the Gloster Meteor, one of the world's fastest aeroplanes, states that the Phantom possesses superior stability at low speeds, and believes the lack of this quality has prevented carrier operations on the Meteor.

The British Navy, however, made successful carrier tests on the De Havilland Vampire.

The practicability of a jet fighter taking a "wave-off" successfully was demonstrated when Commander Davidson was "waved off" the FDR on his fourth approach.

At an approach speed of 95 mph, the Phantom pulled up and climbed away rapidly and safely to circle and complete the landing successfully.

The Phantom design was initiated in 1944, and the first test flight wa made on January 25, 1945, by the lat Woodward Burke, McDonnell chief tes pilot, who was killed in a subsequer test flight.

Lieut.-Commander W. W. Kelly, Nav XFD-1 project engineer, made the fir Navy test flight in July, 1945.

The plane has been at Patuxer Naval Air Station since April, 194 undergoing power-plant, stability, cor trol and performance tests.

Successful "deck" landings and take off tests on the simulated deck a Patuxent were completed prior to th final acceptance trials.

Specifications and limited data o performance were disclosed by th Navy.

They included:—

Top speed—Well over 500 mph.

Range (with one engine)—Over 10(miles.

Ceiling—37,500ft.

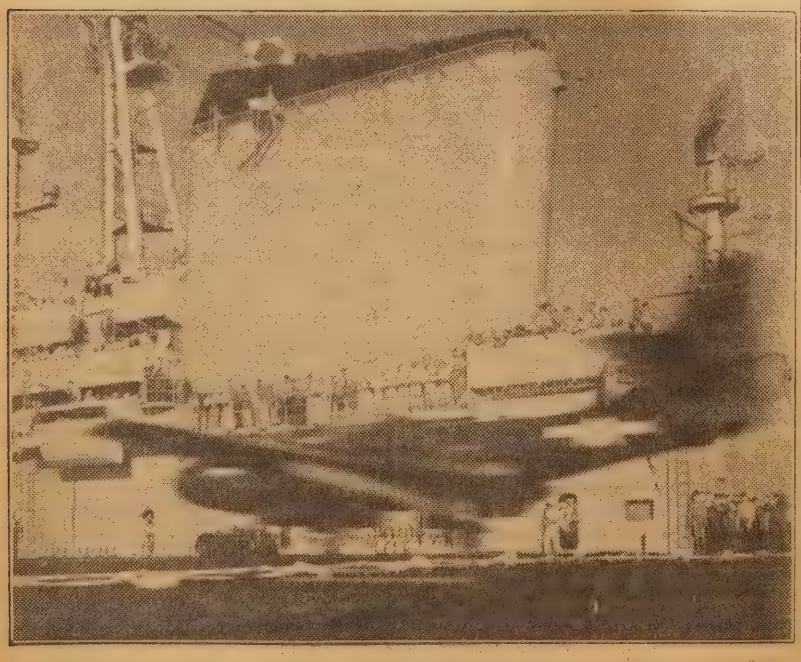
Full wingspan—40ft. 9in.

Span (wings folded)—16ft. 3in.

Length—38ft. 9.1in.

Height—14ft. 2.1in.

Full combat weight—85801b., overlo 96301b.



That smudge in the foreground is the Phantom just airborne.

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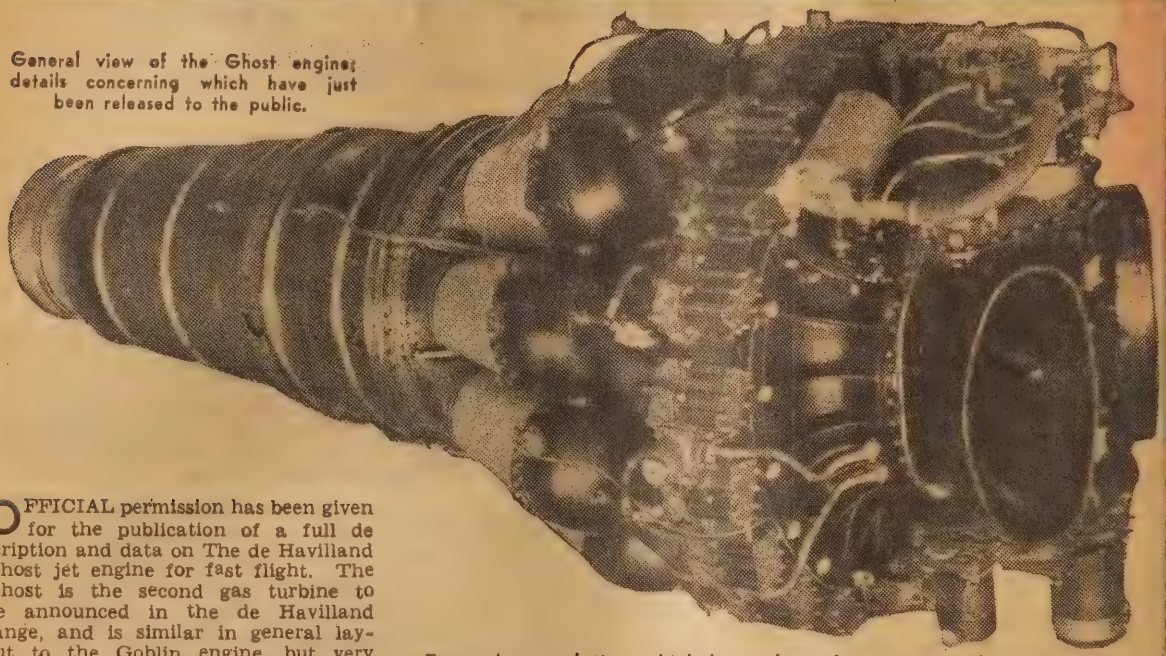
THE NEW GHOST TURBO-JET ENGINE



General view of the Ghost engine; details concerning which have just been released to the public.

From the revolution which has taken place in aircraft engines, several clearly refined types have emerged. The turbo-jet engine is one of these which appears to hold great possibilities. This article describes one of the latest and most powerful types.

OFFICIAL permission has been given for the publication of a full description and data on The de Havilland Ghost jet engine for fast flight. The Ghost is the second gas turbine to be announced in the de Havilland range, and is similar in general layout to the Goblin engine, but very much more powerful. Although only 53 inches in diameter (three inches more than the Goblin) it develops a static thrust of 5000lb., as against the Goblin's current rating of 3000lb. It is thus one of the world's most powerful aero engines and some impression of its capabilities may be gained from the fact that at 600 mph, at sea level, its power output corresponds to 12,000 hp from a propeller-driving engine. Further development will lead to still higher ratings.

LOW THRUST LOSS

Because it takes in all its air at the front, with direct entry to its single-sided impeller, the Ghost, like the Goblin, suffers the minimum loss of thrust due to installation, even in a small and very clean intercepter like the Vampire.

Design work on the Ghost engine was begun in 1943. The prototype first ran in September 1945, and development has continued until the present time, when the Ghost is about to be installed in Vampire and Lancastrian aircraft. Although the first part of its design history took place against a wartime background, the Ghost is, (by virtue of its suitability to a diverse range of installations, and the fuel economy which has been a major design requirement from the first), an engine with a prospect of wide application in the whole field of jet-propelled flight.

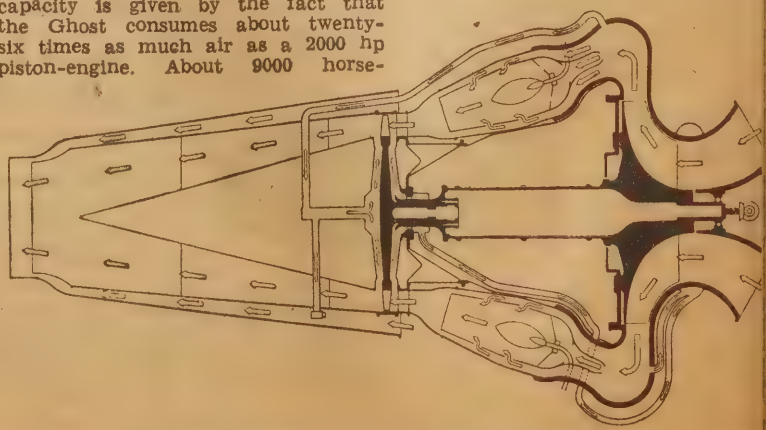
Unison of aircraft and engine design has become steadily more valuable with the increase in aircraft speeds which has been attained in recent years. In other words, test-bed efficiency is now second in importance to installed efficiency, and it was the search for installed efficiency that led the unique layout adopted.

BASIC DESIGN

The basic design features ensure the shortest, simplest, stiffest engine obtainable within a given cowled diameter. A compact engine with a minimum divergence of gas flow is clearly necessary when handling more than a hundred and forty tons of air per hour, compressing, heating and expanding it, and ejecting it at a nozzle velocity of well over a thousand miles an hour. Some impression of the capacity is given by the fact that the Ghost consumes about twenty-six times as much air as a 2000 hp piston-engine. About 9000 horse-power is developed in the turb shaft to compress this quantity inhaled air.

The basic layout employed is s ilar to the Goblin and comprises high-velocity ducted intake feed a single-sided impeller, a straig through combustion system, and single-stage axial turbine with di ejection.

There are important advantages the direct ducting of the air to front face of the single-sided co pressor, especially at high fly speeds. Pressure losses are redu to a minimum, and an increased flow is obtained. Nearly 95 per c



Cross-section diagram showing air flow through the engine.

the available ram effect is obtain-
in the Ghost without creating diffi-
t airflow repercussions. The high-
ocity ducted intake reduces air-
ft drag and minimises internal
turbances common with other sys-
ns.

RECT DUCTING

The arrangement of the engine also
ures a simple installation in either
elage or wing, and an efficient air
ake can be blended into the frame-
rk of the aircraft. The direct duct-
to the front of the impeller elim-
tes the pre-heating of the air which
es place on the rear face of the
uble-sided type, and the cooler air
ng denser gives better engine per-
mance. Alternative types of intake
available to suit different types
installation.

The lower rpm of the single-sided
peller simplifies the design of the
bine, giving improved efficiency
d reduced blade stresses. A moder-
running speed is, in fact, gener-
advantageous throughout the
gine.

Straight-through combustion, or
direct rearward flow of the gases,
a logical device to reduce aerodyn-
ic losses when the quantities are so
at. There is considerable energy
the gases after they leave the tur-
e, and it is necessary to eject them
directly as possible within the lim-
tions of the aircraft design. The
out of the Ghost lends itself to
tallation with a short, and there-
e efficient, jet pipe.

The simple rigid rotating compon-
has design advantages again de-
d in part from the single-sided im-
ler. Like any airscrew, the impeller
pressing forward in its bearings. As
turbine wheel is pressing rear-
rd, the two opposing thrusts can
conveniently balanced by mount-
impeller and turbine rigidly on a
ft in tension, leaving only a small
dual thrust to be taken by the
gle locating bearing.

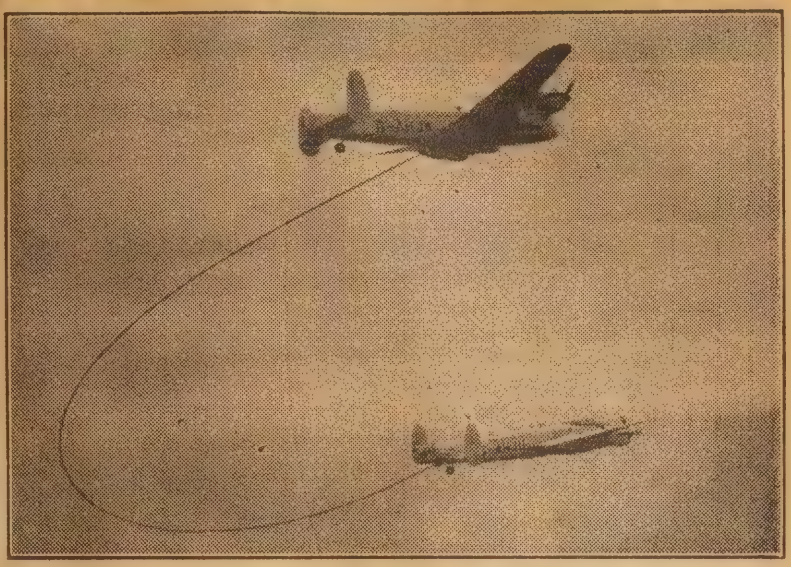
DVANTAGE LOST

ncidentally this advantage is lost
h a double-sided impeller which, of
rse, is naturally balanced in itself,
that all the rearward turbine thrust
to be absorbed by a complicated
ring. In the Ghost, a tubular main
ft of large diameter with impeller
turbine wheel mounted directly on
gives a particularly rigid struc-
e. Perfect alignment and smooth
ning are thus assured, and sim-
ity of manufacture and mainten-
e are uncillary advantages.

With this simple engine layout, a
y robust structure is easily ob-
ed. The main shell is a steel cone,
fly united to the steel assembly
he rear turbine bearing. The main
e, or centre casing, is carried by
l bolts which pass through the
user casing to form pick-up points,
thereby provide front cantilever
unting, essentially like the con-
tional braced mounting for a
dial engine.

he Ghost engine can be considered
consisting of the five following

REFUELLING FROM THE AIR



REFUELLING IN THE AIR.—The idea of refuelling in the air as a commercial proposition and not as a stunt, was conceived by Sir Alan Cobham in the early thirties, as a means of eliminating the hazard caused and necessitated by overloads from inadequately sized and non-surfaced fields. Early experiment proved that planes refuelled in flight could be subjected with safety to carry an increased load. At the present time a scheduled service is being operated successfully by day and night to demonstrate that refuelling in flight is a commercial and worthwhile undertaking. Our picture shows refuelling in flight at Weymouth in rough weather at 700 feet, at a speed of 200 mph. The fuel is passing from one plane to the other at a rate of 100 gallons per minute.

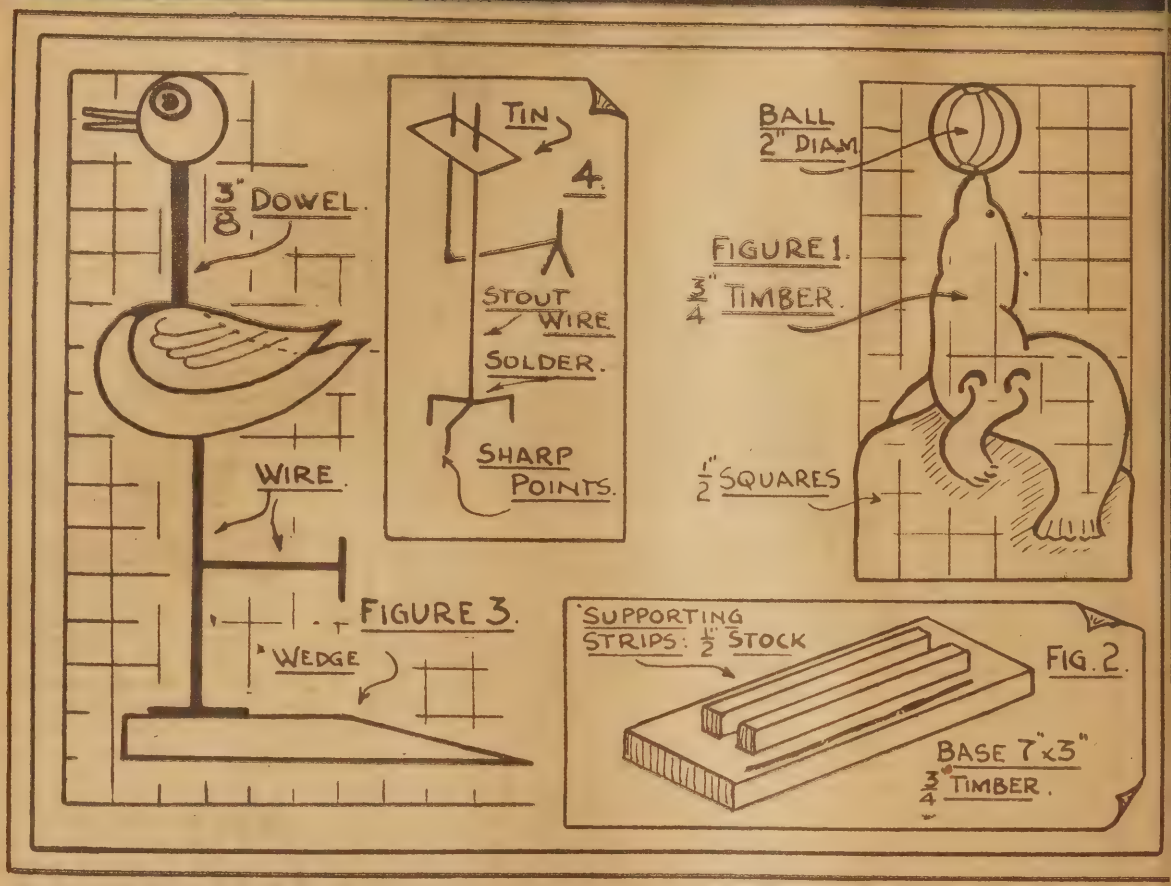
main assemblies—the compressor with rotating shaft and centre casing, the combustion system, the turbine, the exhaust cone assembly, and the wheel cases.

COMPRESSOR ROTATING SHAFTS AND BEARINGS

The compressor which comprises the air intake, the impeller, and the diffuser, is similar in principle to the centrifugal supercharger used in reciprocating engines. Air enters the impeller axially at the forward side, through ducts in the air intake casting. In the impeller the air is compressed and turned through an angle of 90 degrees, so that it is discharged radially from the impeller periphery into discharge passages cast in the diffuser casing. Here the velocity of the air is decreased, and its pressure increased before it is discharged into the combustion system.

The air intake forms the front of the engine and contains a housing for the front bearing assembly. Alternative designs of intake are available to suit different installations. The diffuser casing is cast in two pieces, the air intake being bolted to the forward end and the centre casing to the rearward end. The centre casing which is a conical support of steel can be considered as the backbone of the engine; it is bolted at its rearward end to the rear bearing housing. A sealing plate is also bolted to the rear diffuser casing, and it contains a number of concentrically arranged labyrinth grooves matching with similar grooves on the rear face of the impeller; leakage of air down the rear face of the impeller is reduced by these grooves and their radial position is such that the axial thrust of the rotating assembly is eliminated.

TWO SIMPLE NOVELTY PROJECTS



The bird has a black beak, yellow body and green base. The seal balances a red ball, is colored light blue, and has a green ba

Here are a couple of easy-to-make projects which are both novel and useful. The materials required are quite simple.

A DOOR WEDGE

That part which actually holds the door and prevents it swinging shut is, of course, the wedge. Commence by making this part first from a block of wood 9in. x 3in. x 1in. One end is bevelled back for a distance of about three to four inches, making it to a wedge shape. Do this by first sawing off the waste, planing smooth, then rounding off all the top edges with a file. The two back corners should also be neatly rounded with a chisel and file. Make sure that all rough edges and corners are smooth by finishing off with sandpaper.

The novelty figure is a bird design in stylised treatment. It is made chiefly of wood, but the legs are of wire.

THE HEAD AND BODY

The head is a disc of wood 1¼in. in diameter and ¾in. thick. If made of soft wood, this can be sawn to shape easily and smoothed up with a file. Two ⅛in. holes at right angles to one another must be drilled in the head. One hole is to take the beak and the other is to take the neck. The body is made from a piece of ¾in. thick timber, about 5in. x 3in. Mark it out to the general shape, as shown in the diagram, and saw around the line. Do not worry if the saw cut is not perfectly even. The wings, of which there are two, are made of three-ply, 4in. x 1½in. Tack the two pieces together and copy the shape from the sketch. After being sawn out they are glued and nailed in place on the body. Look at the sketch and you will get a good idea of where to place them. A ⅛in. hole has to be drilled in the body to take the neck.

by

T. E. le Sueur

THE NECK AND BEAK

Both of these pieces are made fr ⅛in. dowel. Before cutting the b to a length of 2in., hold the do in the vice and carefully saw ou tapered piece, going in, say, ab 1½in. This will make it appear though the beak is open. The dowel for the neck is 3½in. long.

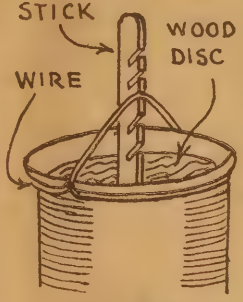
ASSEMBLING

Sandpaper the wooden pieces smo and, after applying some glue to ends of the dowel pieces, push th into place and set aside for the g to dry. If desired the head can twisted slightly to one side and t gives rather an improved appearan

THE LEGS

The legs are made of wire. T gives a spindly effect, as well as ing stronger than wood. The det drawing of figure 4 shows the m arrangement of the shapes to wh they are bent. Make the legs ab 6in. long and of heavy gauge wi The feet with three toes are m of thinner wire with the various pie soldered in place.

HINTS FOR THE WORKSHOP



MEAT PRESSER

When making pressed meats, place a wooden disc on top, and fasten a piece of stout wire round the rim of the container with a loop over the container. A notched stick placed between wire and disc allows various pressures to be applied.

TIE HANGER

A very handy tie hanger can be made by crimping the bottom section of an ordinary wire coat hanger, as illustrated above.

ASTENING

A small piece of tin ⅛in. square is ed to fix the legs to the body. Two les are punched in the tin which then soldered to the legs. When e top ends of the legs are pushed to two holes drilled in the under- ath side of the body, the tin plate n be nailed in position with panel ns and so firmly hold all the pieces gether. As can be seen from the agram, one leg is bent back at right gles and the other is fastened to e wedge. It is a good plan to let e end of this leg fit down tightly to a hole drilled in the wedge. If e ends of the toes also are bent wn at right angles and then driven to small holes in the wedge, the rangement will prove satisfactory d very strong.

AINTING

For painting use colored enamels. ıe one shown was painted generally yellow, with large blue eyes and a ıck pupil. Beak and legs were also ıck, whilst the wedge was green. tails of the feathers on the body d wings were outlined in red.

AT STAND

The seal hat stand is not quite so ficult to make as it is all wood. e chief member is the body and this a piece of wood 11in. x 6in. ⅛in. is needed. Plane both sides the timber till it is smooth, then one side of it sketch out the shape shown in the squared diagram of ure 1. Include the ball in this, n cut the figure to shape.

THE BALL

The ball has next to be built up to the correct thickness. The centre section has already been cut out with the main figure, so on both sides of this glue and nail discs of wood of suitable diameter and about ⅛in. thick. When the glue has set, chisel and file this block of wood to a ball shape. Finish off the rough edges with sand-paper.

THE BASE

The base can be made any shape to suit. The sketch in figure 2 shows it as rectangular, but an oval or even a circular base would look just as well. A small chamfer around the top edge, though not shown in the illustration, will improve the appearance. Two small supporting strips of ⅛in. square material are also needed.

ASSEMBLING

Prepare all the pieces as suggested above and then you are ready for assembling. The figure is fastened from underneath. It is best to apply to the base by skew nailing through some glue to this joint. The supporting strips are glued and nailed in position where shown, two nails going into the base and two into the figure.

PAINTING

Of course, any suitable colors can be chosen as long as they are bright. The ball was painted red, the seal blue and the base green. Details and outlines were done in fine black lines.

THE HAM BANDS WITH BILL MOORE

The results of Australia's first post-war DX contest are to hand and NSW amateurs are to be congratulated on taking out ten of the first eleven places. Results were announced by Bob Cunningham, VK3ML, Federal Contest Manager.

WINNER of the open section was VK2EO Dave Duff, well-known NSW DX man; second, VK2JX Peter Adams, NSW WIA secretary; third, VK2RA Ray Priddle, late Federal President of the WIA. Full scores in the open section are as follows: VK2EO 7164, 2OX 6762, 2RA 5265, 3KX 5115, 2QL 4752, 2YL 3600, 2ZC 3564, 6KW 2013, 2ADT 1930, 6RU 1500, 3XK 1488, 5JS 1098, 3HT 345, 5LC 330, 6RL 3.

NSW won the first three places in the 28mc. section. Winner VK2ADT, second 2ADE, third 2YL. Full scores: VK2ADT 1908, 2ADE 5KG, 720, 3YV 615, 2QL 564, 3FG 492, 5MP 5KG 720, 3YV 615, 2QL 564, 3PG 492, 5MB 465, 2AHM 414, 5WG 408, 2ZC 369, 2OE 351, 3ABA 66 and 3DW 18.

The 14mc. section was much more closely contested. First VK2DG. Triple dead-heat for second, 3KX, 2ZC and 2JX, and third 2AHA. Full scores: VK2DG 1710, 3KX 1638, 2ZC 1638, 2JX 1638, 2AHA 1512, 2DA 1440, 2QL 1386, 7LJ 1296, 3ON 1044, 4TY 828, 3GU 774, 4HR 735 and 4RC 420.

Congratulations to the winners, especially Dave 2EO who battled through with a 66-foot zepp erected the evening before the contest. The coalfields gang did well with five entrants for five places.

The 1947 contest will be run on pre-war lines, as a VK-ZL contest in October, and some of the ardent DX boys are tooling up already.

LI2B

LI2B will be the callsign used by a scientific expedition which will leave Peru shortly. It will be lead by Mr. Thor Heyerdank, Norwegian scientist.

Riding ocean currents on a raft 30 feet by 15 feet, they expect to be about four months on the trip. They are investigating the original migration of the Polynesians. An input of 15 watts will be used on 14, 28 and 56mx, with beam antennae on the latter two bands. Australian amateurs are requested to keep a lookout for LI2B and forward any information to the Federal secretary of the WIA, Box 2611W, GPO, Melbourne. The ARRL and RSGB will also be keeping watches for the expedition.

30 MINUTE SESSION

First news of the cancellation of th minute limit on two-way contacts was over VK2WI and VK3WI on March 2.

Rule 84 in the "Handbook for the Gui of the Operators of Experimental Wi Stations" has been varied and all time mentioned have been deleted. Empha still placed on the inspection of bands frequencies before commencing operatio

This variation will be well received b majority of Australian amateurs and changed at the request of the Wireles stitute of Australia.

MOBILE MARINE VK2ANE DEPARTS

With the departure of the Chertsey Fremantle on February 28, mobile m VK2ANE passed on.

Eric's next stop will be Aden. To da has been unable to obtain permission t a mobile licence from England. The aut ties there will only grant them to c shipping. He hopes to obtain an XA when nearing Italy.

During 140 days' operating 2ANE work countries—WAC 5 times, all on 30 watts. 200 VK's were contacted on 20mx telep

There are quite a few QSL cards standing to 2ANE. Please send them t RSGB or the VK2, WIA, QSL Bureau.

Eric thanks the VK's for the hospi and would like to hear from his many tralian friends. Address, 12 Downs-rd. Helens, Lancs., England.

W.I.A. FEDERAL CONVENTIO

The seventeenth Federal convention o Wireless Institute of Australia will be in Melbourne over Easter, from 4th till April.

Delegates will be present from all divisions and some 54 items are listed o agenda for discussion.

This event is the most important am radio meeting of the year and the progra is mapped out for WIA Federal action i ensuing year.

W.I.A. NEWS

The first three place-getters in the code receiving contest held at the NSW sion's February meeting were as follo 1st VK2GB Bruce Glassop, 2nd VK2ARE Egan, 3rd VK2CE Alf Barnes. The same cording was used as was played at the W Field Day and VK2GB copied 162 out possible 192 characters.

Visitors to this meeting included m marine VK3ABB, from England, VK VK4EJ, VK2FI, VK2AGH and VK2XU. Fryar, VK2NP, has been appointed UHF cer for NSW. 2NP will co-ordinate affairs in this State and co-operate WIA UHF officers in other States. Ross harne, VK2IQ, will be the third WIA ber on the Radio sub-committee of the B fires Advisory Committee.

The NSW division of the WIA will be ducting a complete census of all NSW teurs to ascertain the extent of work don amateurs during the war years. The formation will be recorded for future when dealing with the authorities on ama demands.

11 METRE BAND OPEN

The 11 metre Band was released to Au lian amateurs in an announcement from bourne on February 25th.

The band width available is from 2718 27455kc's. This is an entirely new band Australian amateurs but American sta have been in occupation for some mont

HURSTVILLE DISTRICT AMATE RADIO CLUB

The above Radio Club has been reco tuted after being in recess during the years. They meet every Tuesday evenin Connels Point-rd., South Hurstville. Pres is Frank Tregartha, VK2FT; secretary Ackerman, VK2ALG. Inquiries should be to the latter by letter or ring the assi secretary at LU3855. Hams or inte amateurs in the district are invited to a the weekly meeting.

(Continued on Page 79)

SHORT WAVE NOTES BY RAY SIMPSON

ROYAL VISIT TO SOUTH AFRICA

BROADCASTS NOW HEARD

In the hope that some interesting broadcasts would be heard from South Africa, we spent quite a bit of time in the early hours chasing the always rather elusive South African stations, but though we managed to log a number of the S.A.B.C. stations, only once did we hear anything connected with the Royal Tour of that country. This was from Johannesburg on 9875kc around 1.30 am and it appeared to be a relay from Capetown in connection with a dinner or some such function. Signals were not very loud, but enough was heard to gather what it was about.

LTHOUGH we were disappointed regarding programmes, we did take the opportunity ee how many of these stations we could ; and they were as follows: Johannes- on 4380kc., 4895kc., and 9875kc., and town on 5883kc. We heard also an Eng- speaking station on 4855kc., but could identify it at the time, though from ce now received from Art Cushen, this ld appear to be Pietermaritzburg, as he earing it around 5.30 am when it begins ade out.

addition to the above we have just embered Capetown on 9610kc. which were very surprised to log closing at 1.30 An early morning spent with these ons always proves interesting and if you them well enough to send a report be to do so as they always verify.

DX CONTEST

E have now received quite a number of suggestions regarding our proposed com- ion, and if at all possible we will try ive full details in our next issue of what conditions will be. It is very hard to e the rules flexible enough to give all es of listeners an even chance and we only hope that the final conditions will cceptable to as many listeners as pos- .

seems necessary to have two sections, for the listener who does not have many lications now, and who perhaps has only interested in the hobby for a compara- y short time, and another section for real dyed-in-the wool DX enthusiast who dy has hundreds of verifications and would not want to write to them all over . This class of listener would want to bine his normal listening for new stations his eye also on the contest.

our New Zealand readers will also be ble, some special conditions will have e imposed in order to make their chances l to Australian listeners.

hope to announce the prizes in next th's issue as well, so that everyone know what they are striving to win. We as many as possible to enter and feel when the rules are finalised it will be that even if you only have a modest re- r and are not very experienced you will have a chance of winning a prize.

SOLAR ACTIVITY

a recent news item in the daily Press ve note that Dr. Roy Marshall, Director he Franklin Institute Planetarium at delphia, reports having sighted a sun- estimated to be 70,000 to 80,000 miles Dr. Marshall stated it could be clearly ved without the use of a telescope.

dictions are that the present cycle of spots will reach a maximum towards the f this year, and in connection with this rint the following comment by a BBC eer in a recent issue of "London g."

spot activity continues to increase very ly, and the effect of this upon the iono- e seems likely soon to have definite cussions upon short-wave transmission reception. The present sunspot cycle, in judging by the course of events since inimum in April, 1944—promises either ve rise to solar activity of exceptional itude, or else to reach its maximum in an unusually short time. Already, only two years or so after the minimum, the activity has reached levels comparable to those of about four years before it, and this rapid increase shows no sign of abatement.

Concurrent with the increase in solar activity, and owing, of course, to its effects, there has been a rapid increase in the electrification or "ionization" of the upper atmosphere. And as it is the degree if ionization of this region—the ionosphere—that determines the frequencies suitable for short-wave communication at any particular time of the day, this increase of ionization must be taken careful account of when selecting the frequencies to be used.

SHORT Wave Notes for the May issue are due by April 5, and should be sent direct to Mr. Simpson, 80 Wilga Street, Concord. Notes for the June issue are due on May 3.

When the ionization is high, the highest frequencies (shortest wave-lengths) become of the greatest utility; when it is low the reverse applies. So from September onwards the tendency will be to make greater use of the higher frequencies for transmission over daylight paths, and this situation will probably hold good throughout the northern winter. So far as the night time frequencies are concerned, these will probably decrease somewhat from September towards the mid-winter period, but even so they will often be considerably higher than those that were in use during the same months of last year. All of these measures are not only desirable, of course, but really necessary if the most efficient broadcasting service is to be provided.

The increased ionization will make desirable the use for service to certain countries of a frequency band not hirtherto employed for the purpose—namely, the 28 mcs. broadcasting band. It is more than probable that this band will be suitable for service (of the BBC) to India and the Far East and to South and Central America, as well as continuing to be of service to Africa. It may well be heard in other countries, too, and its use may be found advantageous at some time during the winter for service to North America.

NEW STATION LOGGINGS

HERE are a few details concerning the new stations logged since our last issue.

U.S.S. "IOWA." A very interesting broadcast was heard from this ship on a recent Saturday afternoon around 5 pm, when it was sending out a programme on 9670kc. directed to the CBS in Los Angeles. This broadcast was an interview with a Lieut-Commander Bill Elliott, who was giving details of his duties aboard the ship, which was taking part in the exercises against Pearl Harbor. Strength of signals was excellent and we feel sure that anyone listening on the 31-metre band at the time could not help but hear this transmission.

JOHNSON IS. While tuning round the 36-metre part of the dial one night, we found an excellent signal which was coming from Johnson Navy Radio, which was in communication with some of the Navy planes evidently taking part in the Mid-Pacific exercises. The frequency was 8080kc. and every word could be followed. Also around the same setting we heard Kwajelin Navy Radio, which was also in the hook-up, though not at such good strength. When these two stations went off the air you could hear the planes coming back with their messages. All these stations have again been heard on more than one occasion around 10 pm.

CHINA. Chinese stations are always hard to identify, and the quality of their transmissions are usually very poor, but we have recently heard at least one at very good level. This was XMNG, in Nanking, which was operating on a frequency of 17880kc. at 10.30 pm. Programme was in English, with announcement by a lady. This one has also been reported as operating on 7340kc. Miss Sanderson sends us news about another new one she had heard, XMAG, also in Nanking, which was on 11540kc. with a programme of AFRS items, news in English, &c., at 9.45 pm. At the time of writing, we have not been able to find this one, so it may have changed to a new channel.

SUDAN. The Omdurman Broadcasting Station, located in the Sudan, has now been heard on a new frequency of 9660kc. in the 31-metre band. This outlet was first heard at 2 am, but it is on the air much later as well. While listening to it the other morning, the writer tuned to their other frequency of 13320kc. and found that outlet very much better strength. There was supposed to be a session in English at 3.30 am, but this now seems to have been discontinued, as the usual wailing type native music was still in progress at 3.45 am when we turned it in for the night. We understand this station verifies reports, so if you can get sufficient material for a report, send it along.

NEW FREQUENCIES. In addition to the new station loggings, we also have a few changes of frequency, &c. ZBW3, Hongkong, has now moved from 9525kc to 9510kc., and can be heard there at 9 pm; Saigon have opened up on 6195kc. in addition to the usual 11780kc outlet; Johannesburg has been heard on 9875kc. instead of their assigned frequency of 9912kc. This may even be an additional frequency, though we have never logged them on 9912kc; Paris has been heard in the 41-metre band operating on 7240kc. around 6 am; VLG6 has now changed frequency from 15230kc. to 15240kc. and is much better on the new channel.

NEW STATIONS OF THE MONTH

Call	Kc.	Metres	Location	Time Heard
SAIGON	6195	48.43	Saigon, FIC	9.0 pm
PARIS	7240	41.44	Paris, France	6.0 am
XMNG	7340	40.87	Nanking, China	10.0 pm
JOHNSON IS.	8080	37.13	Johnson Island	10.0 pm
OMDURMAN	9660	31.06	Omdurman, Sudan	3.0 am
JOHANNESBURG	9875	30.38	Johannesburg, SA	2.0 am
XMAG	11540	26.00	Nanking, China	9.30 pm
XMNG	17880	16.78	Nanking, China	10.0 pm

BEST BETS OF THE MONTH—TIME SCHEDULE

This chart for quick reference gives the call, frequency and listening times for the best stations on the air. Where the station is not at good strength when it opens transmission, the time is given at which reception, under normal conditions, should be satisfactory.

6 am TO NOON

VLR2 6150kc Lyndhurst. Very good in morning at 7.0.

GSB 9510kc London. Also heard well at the same time.

OTC5 9740kc Leopoldville. One of the best on the band at 7.0 am.

TAP 9465kc Ankara. Really good signal at 6.30 am.

FZI 11970kc Brazzaville. Listen for the news at 6.45 am.

HOXA 15100kc Panama City. Still coming in nicely at 7.0 am.

WOOW 11870kc New York. Really excellent strength at 7.0 am.

WGEA 15330kc Schenectady. Another American heard nicely at 7.0 am.

NOON TO 6 pm

VLR 9540kc Lyndhurst. Excellent strength to N. America at 4.30 pm.

KCBR 11810kc Delano. Another loud station at the same time.

FZI. 11970kc Brazzaville. This African is heard well at 4.30 pm.

GRX 9690kc London. Very good signal at 5.30 pm.

VLB9 9615kc Shepparton. This station is very loud at 3.0 pm.

KGEX 11730kc Belmont. Another good American station at 4.30 pm.

Berlin. 9730kc. Quite good on some afternoons at 5.30.

HERI 1186kc Schwarzenbourg. Excellent opening 5.0 pm Tues. and Sat.

KNBA 11770kc Dixon. Usually very good in afternoons at 2.0.

6 pm TO MIDNIGHT

GSV 17810kc London. Excellent strength at 10.0 pm.

PCJ 17775kc Hilversum. Quite loud signal opening at 10.30 pm.

Paris 17776kc. This station is easily logged opening at 10.45 pm.

Moscow. 15340kc. This Russian comes in nicely at 10.30 pm.

KRHO 9650kc Honolulu. One of the best on the band at 10.0 pm.

Paris 15350kc. Another French station coming in well at 11.0 pm.

KZRH 9640kc Manila. This Philippine is good level at the same time.

KNBI 6060kc Dixon. Very loud station every night from 7.0.

Saigon. 11780kc. Always heard nicely from about 8.0 pm.

FLASHES FROM EVERYWHERE!

INDONESIA. From time to time readers have written asking the address of the Indonesian Broadcasting Centre station which comes in so well on 11,000kc. We have now received the full address from Art Cushen, and it is pleasing to learn that this station now verifies. Address your letters to the Indonesian Broadcasting Service, 10 Setjodiningratan, Jokjakarta, Java. Their full schedule is 7 pm to 7.30 pm, English; 7.30 pm to 8.30 pm, Dutch; 8.30 pm to 10.30 pm, English; 10.30 pm to 11.30 pm, Indonesian; 11.30 pm to Midnight, French; Midnight to 12.30 am, English, 12.30 am to 1 am, Hindustani, 1 am to 1.30 am, Arabic; 1.30 am to 2 am, Dutch; 2 am to 2.30 am, English. News in English at 7.5 pm, 8.45 pm, 10 pm, midnight and 2 am.

ENGLAND. We learn from the latest issue of "Universalite" that they have received word from Mr. Bryan Hayes, of New Bradwell, that he is no longer able to verify reception of the BBC stations. It appears that the BBC have withdrawn permission to him to verify reports due to the terrific amount of work involved between engineering and monitoring divisions and the large amount of labor involved in keeping the logs up to date. Will all readers therefore discontinue sending reports to Mr. Hayes, as he will obviously now be unable to send out any more verifications as he has done in the past.

CANADA. In a letter from our old correspondent, Mr. M. Foster, whom readers will remember won our last DX competition, we learn that the CBC have discontinued the use of CHOL on 11,720kc and CKLO on 9630kc. On March 2 the station announced that that would be the last transmission from these two stations, and in the future they would be using CKNG on 17,820kc. and CKCS on 15,320kc. Speaking of Canadians, the Montreal station CBLX on 15090kc, can now be heard every night around 10.30 at quite good strength, and it is interesting to hear them give the temperature as well below freezing point, when we are feeling pretty warm at the time.

BRAZIL. We have received advice from the National Geographic Society in Washington that the National Broadcasting Company will participate with the NGS—Army Air Forces expedition to Brazil to observe the total eclipse of the sun next May 20. NBC will develop news broadcasts and television broadcasts of the celestial show. Broadcasts will be made before, during, and after the eclipse, which will start about 10.35 pm Eastern Australian Time. The period of totality will be about four minutes and the eclipse will be observed by a score of scientists who will set up their laboratory near the town of Bocayuva, about 400 miles north of Rio de Janiero. Further information will be given when we receive it.

NICARAGUA. This is possibly one of the hardest countries to log and even harder still to get a verification. A few years ago we used to hear YNLF and also YNLS, but though we wrote to them about three times each, no answer was received. Here are a few to try for: YNWW, 6462kc., Granada "Radio Sport," uses 4-note chime; YNOW, 6850kc., Managua; YNQ, 6950kc., "La Vox de Victoria," Managua; YNAQ, 7413kc., "Ecos de Aire," Masaya; YNFT, 7503kc., Granada; YNBA, 8190kc., Managua; YNDS, 6760kc., Managua; YNQW, 6910kc. Managua. The above should provide plenty to go after for those readers who like the really hard ones, but as the winter comes on, reception is by no means impossible.

MONACO. From the latest issue of "Radio News" we learn the following concerning this European station which so far does not seem to have been heard in this country. "Radio Monte Carlo" 6130kc. opens at 4.30 pm with a musical selection and then a lady announces "Ici Radio Monte Carlo." This station has also been logged in England at 6.30 am to 7.30 am, when a musical programme is in progress. According to the station authorities they are now only using 300 watts for their short-wave transmitter, but early this year they expected to boost their power to 25kw. When this increase in power takes place we can expect to hear them out here and this will mean a new country to most of us.

JAP WAR CRIMINAL TRIAL

ON a recent Sunday night while tuning over the 41 metre band we came across JVW Tokio on 7260kc. giving a very interesting broadcast which evidently had something to do with some of the old Japanese Cabinet. A few words would be given by a Jap and then an American would make a comment and give further observation on the matter under discussion. It was possibly the defending and prosecuting counsel in an exchange of views and though we, of course, could only understand the English part, the American was putting up some very good points. It was rather strange to hear this broadcast from one of the Home Service Japanese stations.

STOP PRESS

WE have just received two items of interest from Miss Sanderson and Mr. P. Byard. Miss Sanderson corrects us regarding the call letters of the station we gave as operating on 9390kc. on Sunday nights with the call letters KGEA. This station is really KJE8, which we remember hearing in February, 1942.

Mr. Byard advises that he has received word from one of the BBC officials that the alleged verification cards issued by Mr. B. Hayes are not recognised by the BBC, and that Mr. Hayes has no connection with that organisation and was not authorised to issue the cards. We await further information on this matter as we know it will be of interest to those who have received such cards.

STATION ADDRESSES

STATION addresses are always sought and here are a few more to add to list.

KZPI.—Philippine Broadcasting Corpora 5th Floor, Filipinas Bldg., Manila, P.I.

HJCX.—"La Vox de Colombia," Apartado Bogota, Colombia.

NAVE.—C/o Radio Television Section, Navy Department, Washington 25, DC.

OAX4P.—"Radio Huancayo," Apartado Huancayo, Peru.

COKG.—Mirander y Saulory, Estrado, P 658, Santiago, Cuba.

WBOS.—Westinghouse Radio Stations Boston, Mass., USA.

SABC.—South Afgrican Broadcasting poration, Box 4559 GPO, Johannes South Africa.

Bucharest.—Radio Romania Liberta, Aleca 2 Bucharest, Rumania.

VUB2.—Station Director, All India R Central Govt. Bldg., Queens-road, Bom India.

Warsaw.—Polskie Radio, Dyrekcja Nacz Warszawa, Poland.

THIS MONTH'S VERIFICATIONS

Mr. A. Cushen. HC4EB, OAX4P, OA YHN.

Mr. J. Fox. SEAC 11810kc., KZND.

Mr. C. Jones. Warsaw, HER5 1186 HER6 15305kc.

Miss D Sanderson. VQ7LO, SEAC 151 Mr. J. Jensen VUD7 15160kc., VLR2, K 15210kc., GSP.

Mr. R. Gillett. ZYB8, CR7AA. Radio M Brussels, 17845kc., SEAC, 7185kc., W COBL, SDB2. Berlin, ZPA5, HER4, 9535 Our Own Listening Post. WLWO, 1179 first report from Australia, TGWA, 1517 Azores, 11090kc., KZPI. VUB2, 7240kc., S 11770kc., WCRC, 17830kc., WOOC, 2150 WCBN. 21570kc., WCBX, 9490kc., W 15250kc., SEAC, 21470kc., WNRX, 610 VLG6, 15240kc.

READERS' REPORTS

THE following readers have sent in re and letters giving details of their r tion during the past month.

Mr. H. O. Roberts, Sandringham, Vic.; J. F. Fox, Dunedin, NZ; Mr. W. Davey, K Cross, NSW; Mr. J. Wiseman, Kew, Mr. R. Clack, Chester Hill, NSW; Mr. Dawkins, Colac, Vic.; Mr. H. Whyte-M Katoomba, NSW; Mr. R. B. Francis, Ersk ville, NSW; Mr. A. Cushen, Invercargill, Mr. M. Foster, Mount Vincent, NSW; M Jones, Gladesville, NSW; Mr. D. B. K Sydney, NSW; Mr. J. Jensen, Bankst NSW; Mr. A. Lee, Merewether, NSW; Mis Sanderson, Malvern, Vic.; Mr. R. G Prospect, SA; Mr. W. H. Helliar, Mal Vic.

OVERSEAS S.W. STATIONS NOW AUDIBLE

The following stations have actually been heard in this country during the past month and the majority should be audible on a sensitive receiver. All times are Australian Eastern Standard Time.

AFRICA

hannesburg. 9875kc., 30.38m. South Africa. This is the new outlet mentioned this month and heard till 2.10 am.

hannesburg. 4380kc., 68.49m. Quite good level from this South African in the early hours of the morning.

hannesburg. 4895kc., 61.29m. Not as good as the 4380kc. channel but can also be heard around 3.0 am.

petown. 9610kc., 31.22m. Was very thrilled to hear this one closing at 1.30 am. Not logged for years now.

petown. 5883kc., 51.0m. On a good morning this South African can be heard till as late as closing time, 7.05 am.

ndurman. 9660kc., 31.06m. Sudan. On a good morning you can log this one till closing time of 5.30 am.

ndurman. 13320kc., 22.52m. Same location. This is much the louder of the two stations and is good at 3.30 am.

kar. 15390kc., 19.49m. Senegal. Nice loud signal on most mornings till around 7.30 am.

giers. 6040kc., 49.66m. Algeria. Can now be logged quite easily around 7.0 am. though not particularly loud.

nanarive. 9690kc., 30.96m. Madagascar. Very good level in the early hours of the morning. Think opens at 2.0 am.

nanarive. 6140kc., 48.66m. Same location. Have heard this one in parallel with 9690kc but not as loud.

ZB. 5900kc., 50.85m. Mafeking, British Bechuanaland. Quite a nice signal at 4.0 am when conditions are good.

ZLO. 4885kc., 61.41m. Nairobi, Kenya. When the noise is not too bad this one comes through well at 5.0 am.

XI 6025kc., 49.80m. Brazzaville, French Equatorial Africa. Heard well at 5.0 am when conditions are good.

XI. 9980kc., 30.06m. Same location. One of the regulars now but not very loud around 7.0 am.

XI. 11970kc., 25.05m. Same location. Really excellent at 7.0 am. The quality of the recordings used is really very fine.

XI. 17530kc., 17.11m. Same location. Listen for this station in the late afternoons around 4.30 pm.

XI. 9440kc., 31.78m. Same location. Never a very loud outlet, but can be logged by comparing programme with that on 11970kc.

ZAA. 4875kc., 61.54m. Lourenco Marques. Mozambique. Listen for this one when you get up around 5.0 am.

ZAA. 6135kc., 48.90m., Same location. Another of these stations which can sometimes be heard till after 6.0 am.

ZBF. 4925kc., 60.91m. Same location. This is the weakest of the Radio Club stations but can sometimes be heard at 4.0 am.

ZBJ. 9650kc., 31.09m. Same location. A really good station and can easily be logged at 5.30 am.

ZX. 7860kc., 38.15m. Cairo, Egypt. Miss Sanderson hears this one with wailing type programme at 6.30 am.

ZV. 10050kc., 29.84m Same location. Have only heard this one on two occasions, when it was very weak at 4.0 am.

TM3. 9370kc., 31.98m. Leopoldville, Belgian Congo. Not a very loud station but is always heard around breakfast time.

TC2. 9740kc., 30.80m. Same location. One of the best at 7.0 am and reaches excellent strength.

TC1 17770kc., 16.88m. Same location. Have only heard this outlet around 11.0 pm and now swamped when SEAC is on.

FR3 9080kc., 33.04m. Rabat, French Morocco Again being heard in the late afternoons.

dio Algerie. 11835kc., 25.35m. Algiers, Algeria. Very nice signal on some afternoons opening at 4.30 pm.

dio Somali. 7125kc., 42.10m. Hargeisa, British Somaliland. Not heard at our post but reported by some readers.

6RB. 9165kc., 32.73m. Benguela, Angola. Rex Gillett hears this one opening at 3.30 am.

CENTRAL AND SOUTH AMERICA

TGWA. 15170kc. 19.78m. Guatemala City, Guatemala. Can now be heard quite well when it opens at midnight.

TIPG. 9615kc. 31.19m. San Jose, Costa Rica This one is quite loud sometimes around 10 pm and easily identified.

HH3W. 10130kc. 29.62m. Port-au-Prince, Haiti. Always heard from around 9.30 pm Announces in French.

HHCM. 6160kc. 48.06m. Same location. Seems to come on the air at 9.35 pm and also uses French in announcements.

HOXA. 15100kc. 19.87m. Panama City, Panama. Miss Sanderson has heard this one in the forenoons on some days.

HP5J. 9607kc. 31.23m. Same location. Have only logged this Panamanian on a few occasions at 10.30 pm.

HRN. 5875kc. 51.07m. Tegucigalpa, Honduras. Logged on two occasions opening at 11 pm. We verified this one many years ago but have not heard it since about 1940

COHI. 6455kc. 46.48m. Santa Clara, Cuba Very hard to hear owing to Morse interference. Best at 10.30 pm.

COCX. 9270kc. 32.36m. Havana, Cuba. Usually heard around 11 pm and also sometimes heard at 7.30 am.

COKG. 8950kc. 33.50m. Santiago, Cuba. The best Cuban at our location and comes in well around 10 pm.

COJK. 8725kc. 34.38m. Camaguey, Cuba Have heard this one on Sunday opening at 9.30 pm.

HP5A. 11695kc. 25.65m. Panama City, Panama. Have just heard this one again at 10 pm.

HCJB. 9958kc. 30.12m. Quito, Ecuador. Heard every night with the usual religious service.

HCJB. 12450kc. 24.11m. Same location. This outlet is much better strength and can easily be followed around 10 pm.

HCJB. 15155kc. 19.85m. Same location. Another of the same stations which is audible both in mornings and also night

CE1180. 11990kc. 20.02m. Santiago, Chile. One of the best now when it opens at 9.30 pm.

CE1190. 11900kc. 25.21m. Valdivia, Chile. Listen for this one at 9.30 pm opening with "Land of Hope and Glory."

ZPA5. 11950kc. 25.10m. Encarnacion, Paraguay. Quite a good station on some nights at 11 pm.

YV5RN. 4915kc. 61.04m. Caracas, Venezuela Still the best of the Venezuelans at night. Opens around 8.30 pm.

PRL7. 9720kc. 20.86m. Rio de Janeiro, Brazil The best time for this Brazilian is around 6.30 am when it is fair strength.

OAX4J. 9340kc. 32.12m. Lima, Peru. This station was heard on one Sunday till well after 5 pm at quite good strength.

NORTH AMERICA

13 Metres.

KNBA. 21610kc. 13.99m. Dixon, Cal. Comes in nicely in the forenoons until closing at 11.15 am.

WCRC. 21570kc. 13.90m. New York. This station can be heard at 1.30 am in English also at 9.30 am in Spanish programme.

WLWS. 21650kc. 13.86m. Cincinnati, Ohio. Melody Roundup can be heard on Saturday nights at 10.15 pm.

WOOW. 21500kc. 13.95m. New York. At 11.30 pm daily you can hear Personality Parade which comes in at quite fair level.

16 Metres.

KNBI. 17770kc. 16.88m. Dixon, Cal. Not very loud at our post but audible until closing at 11.15 am.

KRHO. 17800kc. 16.85m. Honolulu, TH. One of the loudest on the band in the forenoons.

KCBF. 17850kc. 16.81m. Delano, Cal. Another good forenoon station and much louder than last month.

WLWK. 17800kc. 16.85m. Cincinnati, Ohio. On Sunday nights at 10.15 pm you can hear The World in Music.

WLWL. 17955kc. 16.71m. Same location. This station is in parallel with WLWK and more free from interference.

WRUW. 17750kc. 16.90m. Boston, Mass. Another East Coast station which is heard at fair strength around 11 pm.

WNBI. 17780kc. 16.87m. New York. The Voice of America programme, America Speaks, is heard at 11.15 pm.

WCBX. 17830kc. 16.83m. New York. Personality Parade can be logged at quite good strength nightly at 11.30 pm.

WNRA. 18160kc. 16.52m Same location. This station carries the same programme as WCBX at the above times.

WRUL. 17750kc. 16.90m. Boston, Mass On a good morning this Voice of America station is easily heard at 6.45 am.

19 Metres.

KWIX. 15290kc. 19.62m. San Francisco, Cal. A good forenoon station and heard nicely till closing at 11.15 am.

KCBR. 15330kc. 19.57m Delano, Cal. On the air at the same time with same programme.

KCBA. 15240kc. 19.69m. Same location. Still another one with the same programme.

KGEI. 15130kc. 19.83m. Belmont, Cal. Very good in afternoon when the news is given at 3 pm.

KGEX. 15210kc. 19.72m. Same location. Excellent strength until closing at 4 pm

KNBX. 15250kc. 19.67m. Dixon, Cal. When this one closes at 6.45 pm it is putting in an excellent signal.

WNBI. 15150kc. 19.80m. New York. The Latin American service is heard daily around 1.30 pm.

WBOS 15210kc 19.72m. Boston, Mass Quite nice level in the Hymns from Home programme on Mondays at 7.30 am.

WCBN. 15270kc. 19.65m. New York. This C.B.S. station carries the same programme at 7.30 am.

WGEA. 15330kc. 19.57m. Schenectady, NY. Voice of America. America Speaks heard nicely at 6.45 am.

WRUL. 15290kc. 19.62m. Boston, Mass. This World Wide Broadcasting Corp. station is in parallel at 6.45 am.

WLWO. 15350kc. 19.54m. Cincinnati, Ohio. One of the Crosley Corp. outlets also heard well before breakfast time.

WLWR. 15250kc. 19.67m. Same location. Another Crosley station coming in nicely at night around 10.30 pm.

WNRE 15280kc. 19.63m New York. A very loud station both in mornings and also at night.

WOOC. 15200kc. 19.74m. Same location. This CBS station is on the air in the mornings and also at 9 pm.

25 Metres.

KNBX 11790kc. 25.45m Dixon, Cal. Beamed to Japan China, and East Asia from 7.45 pm. Also heard from 7 to 7.30 pm.

KGEX 11720kc. 25.58m. Belmont, Cal. Comes on the air at 4.15 pm when it is very good strength.

KGEI. 11790kc. 25.45m Same location. An excellent outlet until it closes at 6.45 pm.

KWID. 11900kc. 25.18m. San Francisco, Cal. One of the best on the band from 5 pm till closing at 9.30 pm.

KWIX 11890kc. 25.22m. Same location. Not as loud as KWID but heard nightly at quite entertainment level.

WOOW. 11870kc. 25.27m. New York. Excellent strength daily till closing at 7.45 pm.

WCRC. 11830kc. 25.36m. Same location. Another New York station heard nicely in the mornings.

WOOW. 11810kc. 25.40m. Same location. Carries the Voice of America programme from opening time of 8.45 am.

WLWO. 11710kc. 25.62m. Cincinnati, Ohio. A good programme is the Invitation to Music session on Wednesdays at 10.30 pm.

WLWS. 11710kc. 25.62m. Same location. This transmitter is used at 6.15 am when the news is given.

WNRA. 11790kc. 25.45m. New York. News to Europe is heard at 7.45 am.

WNBI. 11890kc. 25.22m. Same location. Another NBC station in the Latin American programme at 7 am.

WRUL. 11730kc. 25.58m. Boston, Mass. This outlet carries the programme for Central America from 7 to 8 am.

WGEA. 11810kc. 25.40m. Schenectady, NY. Listen for this one opening at 8 am with the Portuguese language programme

WRUW 11730kc 25.57m. Boston, Mass. Have heard this station at 3 am with a programme in French

31 Metres.

KNBA. 9490kc 31.61m. Dixon, Cal. Opens nightly at 7 pm and maintains its strength until closing at 2 am

KWID. 9570kc. 31.35m. San Francisco Cal. Can be heard nicely in afternoons and also on again at 10 pm

KRHO. 9650kc., 31.09m. Honolulu, T.H. Excellent strength every night and a real standby now.

KCBR. 9700kc., 30.93m. Delano, Cal. When this one opens at 8.0 pm it is excellent strength.

KCBA/F. 9750kc., 30.78m. Same location. This station is also very well heard every night.

KGEI. 9530kc., 31.48m. Belmont, Cal. Really good entertainment from this General Electric station nightly.

WCBX. 9490kc., 31.60m. New York, NY. Easily heard in the mornings when the news in French is given at 6.30 am.

WLWO. 9590kc., 31.28m. Cincinnati, Ohio. The Latin American service can be heard at 8.0 am at fair strength.

WOOW. 9490kc., 31.61m. New York. Beamed to Europe, this station opens at 8.15 am when it is fair level.

WRUA. 9570kc., 31.35m. Boston, Mass. This World Wide station is used in parallel at the same time.

WGEO. 9530kc., 31.48m. Schenectady, NY. Latin American programme comes from this GE station at 8.0 am.

WCRC. 9650kc., 31.09m. New York. This CBS station is another beamed to South America at the same time.

WLWR. 9700kc., 30.93m. Cincinnati, Ohio. Central America is served by the Crosley station and can be heard closing at 3 pm.

WLWK. 9590kc., 31.28m. Same location. This station is used from 7.30 am till 7.45 am with news in Italian.

49 Metres.

KNBI. 6060kc., 49.50m. Dixon, Cal. Excellent strength during its entire transmission period from 7.0 pm till 2.0 am.

WLWK. 6080kc., 49.34m. Cincinnati, Ohio. Can only be heard on a very good day when it closes at 3.0 pm.

Between band stations.

WNRI. 13050kc., 22.99m. New York. This New York station can be heard around midnight at fair level.

CANADA.

CBLX. 15090kc., 19.88m. Montreal, Que. Improved greatly since last month and quite good at 10 pm with music, news and weather.

CKCS. 15320kc., 19.58m. Same location. This outlet is now being used in the session which closes at 9.05 am.

CKNC. 17820kc., 16.84m. Same location. Has been heard on Sunday opening at 10.0 pm and is also now used in mornings at 7 am.

CKCX. 15190kc., 19.75m. Same location. Heard on some nights opening at midnight, but very weak.

CFRX. 6070kc., 49.46m. Toronto, Ont. At some locations is quite good strength at 9.30 pm with music, news and weather.

CBRX. 6160kc., 48.70m. Vancouver, BC. Surprisingly good in the early mornings at 1.30 am.

CJRX. 11720kc., 25.60m. Winnipeg, Man. Again heard on a Sunday afternoon closing at 5.0 pm.

CKLO. 9630kc., 31.15m. Montreal, Que. Heard in a special programme opening at 8.0 pm.

MEXICO.

XDY. 9924kc., 30.23m. Chapultepec, Mexico. This one can now always be heard opening about 12.50 am and closing 1.20 am.

XEWW. 9500kc., 31.58m. Mexico City. Still the most consistent Mexican and is good both in afternoons and also midnight.

XERQ. 9615kc., 31.12m. Same location. Have only logged this one in the afternoons around 3.30 pm.

XEBT. 9625kc., 31.17m. Same location. This Mexican is also heard in afternoons and even better opening at midnight.

XEQQ. 9680kc., 30.99m. Same location. Never very good now as at midnight it is mixed up with a Dutch speaking station.

XEBR. 11820kc., 25.38m. Hermosillo. On a good morning can be logged around 1.0 am.

XEHH. 11880kc., 25.25m. Mexico City. Miss Sanderson is hearing this one with news in Spanish at 12.30 pm and chimes 12.45 pm.

INDIA AND ASIA

XORA. 11690kc. 25.66m. Shanghai. News and music heard at 8 pm.

XRRA. 9920kc. 33.63m. Peiping. Fair strength around 9 pm.

XGOA. 9730kc. 30.82m. Chungking. Very good at 10 pm.

XGOY. 6140kc. 48.86m. Chungking. News can be heard midnight.

XGOA. 11830kc. 25.36m. Chungking. Quite good sometimes at 9 pm.

XGOA. 9730kc. 30.82m. Chungking. Very good at 10 pm.

XMTA. 12210kc. 24.56m. Changsha. Good strength at 9 pm.

XGOE. 9820kc. 30.56m. Kweilin. News in English at 9 pm.

XRAY. 8890kc. 33.75m. Peiping. Opens every night at 8.30.

XMAG. 11540kc. 26.00m. Nanking. News AFRS station reported by Miss Sanderson. News in English at 9.45 pm.

XMNG. 17880kc. 16.68m. Nanking. This is an AFRS station which we have heard at 10 pm. Also reported as on 7340kc.

ZBW3. 9510kc. 31.55m. Hongkong. BBC news at 9 pm followed by music until 9.30 pm. Notice changed frequency from 9525kc.

CR8AA. 9230kc. 32.43m. Macau, Portuguese China. Can be heard at 10 pm but morse is very troublesome.

SEAC. 6075kc. 49.38m. Colombo, Ceylon. Not nearly as loud as it used to be but can still be heard nightly.

SEAC. 11770kc. 25.49m. Same location. Listen for the news in English at 1 am.

SEAC. 15120kc. 19.84m. Same location. One of the best outlets and heard well at 8.15 pm. Also Monday morning until 6.30.

SEAC. 17770kc. 16.88m. Same location. Terrific strength from this outlet on some nights at 9.

Singapore. 4825kc. 62.18m. Heard this outlet at excellent level once at 4.30 am. May have been special programme.

Singapore. 6770kc. 44.31m. Rather noisy but can be followed on a good night.

Singapore. 15275kc. 19.64m. Very good channel and heard at very good strength at 8 pm. Also heard on 15300kc.

KZPI—9710kc. 30.90m. Manila, Philippine Islands. Comes in nicely every night and can also be logged at 6 am.

KZRH. 9640kc. 31.10m. Same location. This is a much louder station and is good entertainment at night.

Saigon. 4810kc. 62.37m. French Indo China. Rather noisy but can be logged nightly.

Saigon. 6195kc. 48.43m. This channel which used to be used before the war is again being used and strength quite good.

Saigon. 11780kc. 25.47m. Strength has faded a little at our location but it can always be identified around 8 pm.

HS8PD. 5990kc. 50.08m. Bangkok, Siam. Very noisy signal but English can sometimes be heard around 9.30 pm.

Rangoon. 6040kc. 49.67m. Burma. On the air nightly but never a very interesting station.

Macassar. 9360kc. 32.0m. Celebes. Some good records are heard from this station at night.

YHN. 11000kc. 27.27m. Jokjakarta, Java. One of the loudest stations on the band at night.

WLKS. 6105kc. 49.14m. Kure, Japan. This BCOF station can now be heard quite well just before it closes at 8 pm.

FXE. 8030kc. 37.52m. Beirut, Syria. Have heard this one on a few mornings till around 5 o'clock.

Kuala Lumpur, 6170kc. 48.62m. Selangor. Always heard at night, but not an interesting station.

Sharq al Adna. 6170kc. 48.9m. Jaffa, Palestine. This station was heard early in the month at 2 am.

VUD2. 3495kc. 85.84m. Delhi, India. The news can be heard on this channel at 1.30 am.

VUB2, 3365kc, 89.15m. Bombay, India. This Indian is easily heard around 2.30 am.

JCKW. 7220kc. 41.55m. Jerusalem, Palestine. Has again been heard until it closes with English announcement at 5.30 am.

JODK. 2510kc. 119.5m. Seoul, Korea. Very hard to hear it through the noise but is always there around 9 pm.

Tokio. 4950kc. 60.61m. Japan. Has increased in strength and has good programmes every night around 9.

EPB. 15100kc. 19.87m. Teheran, Iran. Never very loud at our location but can often be heard at 10 pm.

EUROPE

SVM. 9935kc., 30.20m. Athens, Greece. Heard this one at 2.0 am at excellent strength in transmission to London.

Athens. 7295kc., 41.12m. Greece. Can still be heard with the news in English at 6.15 am.

TAP. 9465kc., 31.70m. Ankara, Turkey. One of the best on the 31 metre band at 7.0 am.

Brussels. 17804kc., 16.82m. Belgium. Still being heard on this band until closing at 10.30 pm.

Andorra. 5980kc., 50.02m. Very difficult to hear this station now but on a good morning it comes in at fair strength at 7.0 am.

Madrid. 9370kc., 32.0m, Spain. This has become quite a regular station and never varies much in strength.

Sofia. 9350kc., 32.09m. Bulgaria. Has gone off a lot now and very hard to log at 6.30 am.

Milan. 9630kc., 31.15m. Italy. Has been heard quite well at 6.30 am in operatic programme.

Milan. 11810kc., 25.40m. Same location. Have this outlet in parallel with 9630 on some occasions.

OLR4A. 11840kc., 25.34m. Prague, Czechoslovakia. Heard at 6.30 am and also on two occasions opening at 4.30 pm.

OLR5C. 15160kc., 19.79m. Same location. Listen for this Czech when it comes on the air at 1.0 am.

OLR2A. 6010kc., 49.92m. Same location. This outlet is again in use and can easily be heard at 7.0 am with horn signal.

Munich. 6170kc., 48.62m. Germany. Heard at fair strength in the mornings with AFRS programmes and relays.

Munich. 7290kc., 41.15m. Same location. This station is used in parallel at same time.

Munich. 9540kc., 31.45m. Same location. Definitely the loudest of these stations and very good till closing at 7.30 am.

HVJ. 6190kc., 48.47m. Vatican City. Come in very well at 6.0 am when English is heard.

HVJ. 5970kc., 50.27m. Same location. Used in parallel with 6190kc. at the same time.

HVJ. 9660kc., 31.06m. Same location. This is the best Vatican station at our post and heard at 4.30 am.

PCJ. 9590kc., 31.28m. Hilversum, Holland. Programme for NZ and Australia on Tuesdays from 6.0 pm to 7.30 pm.

PCJ2. 15220kc., 19.71m. Same location. Very good station when it opens at 10.3 pm.

PCJ. 17770kc., 16.88m. Same location. Have heard this one on a Thursday morning at 2.30 am.

PHI. 6023kc., 49.82m. Same location. This one has been heard on a Monday morning opening weakly at 7.0 am.

SDB2. 10780kc., 27.83m. Motala, Sweden. Nice level from this station in early hours and still audible at 6.30 am.

SBP. 11705kc., 25.63m. Same location. Can be heard in the late afternoons.

HE15. 11715kc., 25.61m. Schwarzenbourg, Switzerland. Very nice signal on Tuesdays and Saturdays from 5.0 pm to 6.30 pm.

HER5. 11865kc., 25.28m. Same location. This transmitter is used at the same time and is even louder on most days.

HER7. 17784kc., 16.87m. Same location. This is a Mondays only station and can be logged at 6.0 pm.

HER4. 9535kc., 31.47m. Same location. Very difficult to log this outlet now but can sometimes be heard at 7.0 am.

HER6. 15305kc., 19.60m. Same location. Listen for this Swiss station when it comes on the air at 1.0 am.

HER3. 6165kc., 48.66m. Same location. Now being used regularly again and quite nice signal at 6.30 am.

Leipzig. 9730kc., 30.83m. Germany. Have heard this one in the very early hours and also at 3.0 pm.

OIX2. 9503kc., 31.57m. Lahti, Finland. Never a very loud station but audible most days at 6.0 am.

Paris. 15240kc., 19.69m. France. This outlet reaches excellent strength at midnight.

Paris. 15350kc., 19.54m. Same location. Another of the French stations used in parallel with 15240kc. and just as loud.

Paris. 7240kc., 41.44m. Same location. new outlet which can be logged at 6.0 am.

Paris. 9520kc., 31.51m. Same location. Another early morning Frenchman and heard best at about 6.0 am.

Azores. 7017kc., 42.76m. Ponta Delgada, Azores. This outlet is now being used in place of the one on 11090kc.

CSX. 6365kc., 47.15m. Lisbon, Portugal. Very weak station but audible around 6.30 am.

ZAA. 7850kc., 38.15m. Tirana, Albania. Good signal with the news in English at 6.15 am.

CS2WI. 12450kc., 24.10m. Parede, Portugal. Heard in New Zealand at 5.0 am at fair strength. Note change in frequency.

AUSTRALIA AND OCEANIA

VLQ3. 9660kc. 31.06m. Brisbane. This outlet is now being used in the mornings and also at night in place of those of 41m.

VLA4. 11770kc. 25.49m. A really excellent signal from this one from 6.30 am until 9 am.

VLG6. 15240kc. 19.69m. Now being used in the afternoon session to North America. Note changed frequency from 15230kc.

VLB5. 21540kc. 13.93m. Another good station heoard on Saturday afternoon for the Forces from 1.15 pm.

VLB8. 21600kc. 13.89m. This outlet is also used on Saturdays from 6.30 pm till 9 pm.

VLA9. 21600kc. 13.89m. Tune this one in from 9 30 am with the programme direct to North America.

Noumea. 6160kc. 48.70m. Very much better now and can be heard quite nicely around 7.30 pm.

Suva. 6170kc. 48.62m. Fiji When this one is on the air it is very loud giving the weather reports.

Nadi. 6170kc. 48.62m. Fiji. This is another of the Fiji weather stations and is heard often at night.

OFF THE RECORD — NEWS & REVIEWS

The record lovers eye's are beginning to glisten over the good things now appearing in the monthly lists, and from what I am told, there is no reason to doubt the succession of fine releases will be broken. In March, the first of the Chopin Mazurkas are perhaps likely to be most popular.

CHOPIN'S MAZURKAS, Vol. 1. ARTHUR UBINSTEIN, Pianist. F sharp minor and C iarp minor, Op. 6, Nos. 1 and 2; A minor, p. 7, No. 2; E. major, Op. 6, No. 3.—ED. 454.

F minor, A flat major and C major, Op Nos. 3, 4 and 5. A flat major, Op. 41, No. E flat minor, Op. 6, No. 4; A flat major, p. 24, No. 3—ED. 455.

C minor, Op. 30, No. 1; B flat major, Op. No. 1; E minor, Op. 17, No. 2; B flat ajor, Op. 17, No. 1—ED. 456.

A minor, Op. 17, No. 4; A flat major, Op. , No. 3.—ED. 457.

E minor, Op. 41, No. 2; C major, Op. 24. o. 2; G minor, Op. 24, No. 1; D flat major, p. 30, No. 3.—ED. 458.

B flat minor, Op. 24, No. 4; B minor, Op. , No. 2; G minor, Op. 67, No 2; C major. p. 67, No. 3.—ED. 459.

G sharp minor, Op. 33, No. 1; A minor, p. 67, No. 4; F major, Op. 68, No. 3; C iarp minor, Op. 30, No. 4.—ED. 460.

Chopin's music has a magic all of its own. ven the Nocturnes of John Field, from which nopin undoubtedly borrowed many ideas, ave a flavor entirely different, although there re passages which, in their use of technical evices, might have been written by either. In the Mazurkas, the first volume of which released this month, there is a store of ally fine music. There seems to be a somehat more than usual philosophic strain in me of them, if that term can really be pplied at all, than elsewhere in Chopin's usic.

You will find here and there something hich is a little more than lovely, or charmg, or even facile. In the Preludes and tudies, the general atmosphere is more in le music than in the mind.

Concerning Rubinstein, you may have heard pianist play some of these Mazurkas a little ore tellingly, and certainly with less reraint. I am one of those who fight shy of o much abandon, too much "expression" nd too much carefree use of rubato and ntiment.

But I'm sure you have rarely heard them layed more sanely, thoughtfully, and satisingly, if I can use such a word. HMV ere wise to choose a pianist with this pproach, and as a result, you will find ie records musically will wear well.

But don't get the idea that these records ck imagination. They are full of it. Each iece will stand examination, and, I suggest erit ready approval in the turning of ich vital phrase, and in the general fine nse of timing.

A splendid bit of work, which encourages s to anticipate the remainder of his Chopin ecords with relish.

If I were to single out one disc more an another, it would be ED. 457, Nos. 3 and of Opus 17. I think you will agree that l my remarks are borne out in these two amples.

NOCTURNE IN A MAJOR—NOCTURNE IN MAJOR (Field), played by LOUIS KENTER. Columbia DOX 829.

In my remarks on the Chopin Mazurkas I entioned the Nocturnes of Field, who is redited with their invention. Here is a lendid record of two really beautiful Nocrnes which, particularly the A Major, are riking examples of Chopin's debt to the nglishman. But you will notice the similarity superficial only. The two men mentally ere a long way apart. The performance is imirable.

"TILL EULENSPIEGEL'S MERRY PRANKS" PUS 28 (Strauss), played by the BOSTON YMPHONY ORCHESTRA, conducted by OUSSEVITSKY. HMV ED. 452/3.

This musical presentation of the ubiquitous ll—rogue, charmer and dreamer of the gend on which the score is based—is obably the most successful of all Strauss' ne poems. It does far more, and more btley, in less time than any other.

In a short space we are given a succession escapades featuring this old rascal, his aggering, his love making, his impudence, s fear when the rope threatens him, his nstitutional lack of reality even in this tremity.

And we have also the lovable strain that mehow seems to run through the make-up all non-vicious, non-repentant rascals. The manner in which all this is written into the music, in addition to the marvellously live and brilliant orchestration, demonstrates the Strauss genius to the full.

There is really a special place in programme music for "Till." It is so vastly removed from the sweet flowing music which means a broad river, or the cuckoo sound which means springtime. These are obvious and heavy handed tricks compared with the subtle swift Strauss touches and phrases, which leave an impression on the mind before we realise the notes have sounded.

It is an exceptional release on all points. The performance is particularly brilliant and adequate. The recording is good enough to rank with some of the highlights of the past.

ISOBEL BAILLIE, Soprano. Organ Acc. by Bertram Harrison—(a) In Faith I Quiet Wait; (b) Come Sweetest Death (Bach); and Be Thou With Me (Bach). DOX 822.

This singer has many admirers, and a particularly sweet, pure tone. She does these songs very well, and the recording is somewhat better than in others of her records, although thorn needles you will probably find preferable to steel.

ALL AMERICAN ORCHESTRA. Conducted Leopold Stokowski—"Come, Sweet Death" (Bach, trans. Stokowski). DOX 599.

Rather a coincidence that this record should follow Isobel Baillie's, which I fear is the more successful. The arrangement is quite effective, but the recording seems to lack the amount of body required. However, it has its good points.

YEHUDI MENUHIN, Violinist (Piano acc. by Marcel Gazelle).—"Ave Maria" (Schubert arr. Menuhin) and "Negro Spiritual Melody" (from Largo of "New World" Symphony), (Dvorak-Kreisler). ED. 462.

I cannot altogether congratulate Menuhin on this disc, although the Ave Maria is played well enough except for its rather abrupt ending. Perhaps Heifetz spoiled me for this with his first record so many years ago. As for the "New World" Largo, it's time people were content to leave it in its original setting, particularly people like Menuhin who are quite capable of playing something else.

EDMUND KURTZ, 'Cellist Piano acc. by Emanuel Bay—"Danse Orientale. Op. 2, No. 1 (Rachmaninoff), and "Adagio" (Grazioli). ED. 461.

'Cello records are something of a rarity at least in solo with piano accompaniment. Kurtz produces some beautiful tone and legato playing on this disc which is very well recorded. From this latter point of view it is one of the best I have heard for some time.

BRITISH FILM FESTIVAL, 1946.—Scenes from Notable British Pictures of the War (with Symphony Orchestra). — "The Way Ahead" (Leslie Mitchell, Stanley Holloway, Raymond Huntley, Hugh Burden). "The Way to the Stars" (Michael Redgrave, Rosamund John, John Mills) and "Get Cracking" (George Formby). DOX. 823. "The Man in Grey (Margaret Lockwood and Phyllis Calvert), and "49th Parallel" (Eric Portman) "49th Parallel" (Anton Walbrook), and "The Young Mr. Pitt" (Robert Donat). DOX 824.

Three very interesting discs which should be popular with film goers with memories of these fine films.

H.M.V.

SYMPHONY ORCHESTRA—"Reminiscences of Tchaikovsky." EB. 362.

Many highlights of Tchaikovsky Symphonies, Concerti, and other well-known melodies. They are well played, too, and should appeal to those who like medleys.

Other recent releases include the following:

H.M.V.

VICTOR MALE CHORUS, with Tenor Solos —"Come Back to Erin" and "Macushla." EA. 3439.

SAMMY KAYE AND HIS ORCHESTRA—"Zip-A-Dee Doo Dah" and "Sooner or Later." EA. 3454.

JOHNNY DESMOND WITH ORCHESTRA—"In the Moon Mist" and "You Stole My Heart." EA. 3455.

HARRY HAYES AND HIS BAND — "My Love" and "Five Flat Flurry." EA. 3456.

TOMMY DORSEY AND HIS ORCHESTRA—"Make Believe" and "Can't Help Lovin' Dat Man." EA. 3457.

FREDDY MARTIN AND HIS ORCHESTRA —"On the Boardwalk" and "You Put a Song in my Heart." E. 3458.

PERRY COMO WITH ORCHESTRA—"One More Vote" and "If I'm Lucky." EA. 3459.

BETTY HUTTON WITH ORCHESTRA—"My Pickle Eye" and "What Did You Put in That Kiss." EA. 3460.

PETER DAWSON, accompanied by Alfred Shaw and his Orchestra—"Calling Me Home Again" and "God's With You Every Day." EA. 3461. "The Bushrangers" and "A Rolling Stone." EA. 3462.

PAUL FENOULHET WITH ORCHESTRA—"Cement Mixer" and "I Fall in Love With You Every Day." EA. 3467.

DUKE ELLINGTON AND HIS ORCHESTRA —"Come to Baby, Do" and "The Wonder of You." EA. 3468.

DENNIS DAY WITH ORCHESTRA—"April Showers" and "The Whole World is Singing My Song." EA. 3469.

GLENN MILLER AND HIS ORCHESTRA—"Moonlight Serenade" and "Mister Meadowlark." EA. 3463.

DIZZY GILLESPIE AND HIS ORCHESTRA —"Night in Tunisia" and "Old Man Rebop." Dizzy Gillespie (Trp.); Don Byas (Ten.); Milt Jackson (Vib.); Al Haigh (Pno.); Bill de Arango (Gtr.); Ray Brown (Bass); J. C. Heard (Dms.).

SPIKE JONES AND HIS CITY SLICKERS —"Hotcha Cornia" and "The Glow-Worm." EA. 3464.

BETTY RHODES WITH ORCHESTRA—"Somewhere in the Night" and "This is Always." EA. 3465.

HELEN CARROL AND THE SATISFYERS—"Ole Buttermilk Sky" and "Let's Sail to Dreamland." EA. 3466.

REGAL-ZONOPHONE.

SHIRLEY THOMS, Singing and Yodelling with Guitar—"Australia, Land of My Dreams" and "Rodeo in the West." G. 25075.

SALVATION ARMY CROYDON SONGSTER —"Tell Me the Story of Jesus" and "The Wounds of Christ." G. 25076.

KAY KYSER AND HIS ORCH.—"Ole Buttermilk Sky" and "Do You Love Me?" G. 25086.

"HANK," THE SINGING RANGER (with Guitar)—"We'll Never Say Goodbye, Just Say So Long" and "Lonely and Heartsick." G. 25087.

SLIM DUSTY (The Dusty Trail Yodeller)—"How Can I Smile When I'm Lonely" and "I've Been a Fool Too Long." G. 25088.

REGINALD PURSGLOVE AND HIS MUSIC MAKERS—"Bless You" and "You Shouldn't've Said." G. 25093.

LES BROWN AND HIS ORCHESTRA—"The Whole World is Singing My Song" and "The Best Man." G. 25089.

COLUMBIA.

VICTOR SILVESTER AND HIS BALLROOM ORCH.—"Bless You" and "Competition Waltz." DO. 2966.

CLAUDE THORNHILL AND HIS ORCHESTRA—"It's a Pity to Say Good-night" and "Twilight Song." DO. 2967.

FRANK SINATRA WITH ORCHESTRA.—"The Things We Did Last Summer" and "She's Funny That Way." DO. 2968.

HARRY JAMES AND HIS ORCHESTRA—"If I'm Lucky" and "This is Always." DO. 2963.

DINAH SHORE WITH ORCHESTRA—"I Never Love Again" and "That Little Dre... Got Nowhere." DO. 2964.

THE CHARIOTEERS WITH ORCHEST... (Vocal)—"On the Boardwalk" and "Y... Make Me Feel So Young." DO. 2960.

FRANK SINATRA WITH ORCHESTRA "Somewhere in the Night" and "Five Minu... More." DO. 2961.

HARRY JAMES AND HIS ORCHESTRA "Feet Dragging Blues." Harry James, Ja... Palmer, Claude Bowen, J. Schaeffer (Tpts Truett Jones, Dalton Rizzotto, Bruce Squi... (Tmbs.); Dave Matthews, Drew Page, Cla... Lakey, W. Luther (Reeds); Jack Gardn... (Pno.); Red Kent (Gtr.); Thurman Tea... (Bass); Mickey Scrime (Dms.); and "K... Porter Stomp." Probably same personn... except Ralph Hawkins (Dms.) for Mick... Scrime. DO. 2962.

VICTOR SILVESTER AND HIS BALLROO... ORCH.—"You're Nobody 'Til Somebody Lo... You" and "You Couldn't Be Sweeter." D... 2957.

FRANKIE CARLE—"After You've Gone" a... "Somebody Loves Me." DO. 2958.

KATE SMITH WITH ORCHESTRA—"Wh... the River Shannon Flows" and "That's ... Irish Lullaby." DO. 2959.

PARLOPHONE

LOUIS ARMSTRONG AND HIS HOT SEV... —Hot Jazz Classic No. 19—"Hotter Th... That"—Louis Armstrong (Tpt.); Johnny Doc... (Clt.); Kid Ory (Tmb.); Lilian Armstro... (Pno.); Lonnie Johnson (Gtr.); Johnny ... Cyr (Bjo.); Pete Briggs (Tuba); Baby Doc... (Dms.); Recorded December 10, 1927. A... "That's When I'll Come Back." Same p... sonnel without Lonnie Johnson. Record... May, 1927.

BENNY GOODMAN AND HIS ORCHEST... —"I Don't Know Enough About You" a... "I Wish I Could Tell You." A. 7533.

BILLY PENROSE QUARTET—"Lazy Boog... and "Boogie in the Groove." Billy Penr... (Pno.); Paul Rich (Gtr.); Doug Calderwo... (Bass); Norrie Gromley (Dms.). A. 7584.

ROBERTO INGLEZ AND HIS ORCHEST... —"Two Silhouettes" and "Come Closer ... Me." A. 7580.

THE ORGAN, THE DANCE BAND AND ... —"Bless You" and "When London is Say... Goodnight." A. 7582.

GERALDO AND HIS ORCHESTRA... "Down in the Valley" and "Pretendin'... A. 7585.

DOROTHY SQUIRES WITH ORCHESTRA... "There's a Fairy in My Garden" and "... Friends are Golden Friends." A7586.

DECCA

CONNIE BOSWELL WITH ORCHESTR... "Sweetheart" and "Let it Snow, Let ... Snow, Let it Snow." T. 6000.

BING CROSBY WITH ORCHESTRA—"... By Myself" and "Just One of the Thing... Y. 6001.

ANDREWS SISTERS WITH ORCH.—"A M... is Brother to a Mule" and "The House ... Blue Lights." T. 6002.

HAM NOTES

(Continued from Page 72)

KG GUAM, QSL CARDS

R. K. Clark forwards the latest address for e KG QSL Bureau, care Guam Radio Amair League, Box 30, Staff Commander, rianas FPO, San Francisco.

This information comes from the chief gineer of KU5Q; he also states that KG4EZ a pirate.

W-VE DX CONTEST

Greatest problem in the W-VE DX cont was not to contact the Americans, but obtain some definite news of contest, rules d times, &c.

January QST containing the rules was late arriving and the only news was via W tions.

One prospective winner believed the first ekend ended at 10 am on the Sunday, and tired for some sleep at that hour. Listening out eight hours later he found everyone still ing strong.

Some arrangements must be made with the RRL that prior advice be forwarded, simi to that for BERU contests. Prewar on a uple of occasions, rules were also late.

Judging from the activity, some big scores ould be piled up in both the Phone and V sections. 2ANN, 2EO, 2YL, 2ADT, 2TI, S, 2VA and 4LW are some that should ore well.

DX AND PERSONAL PARS

2YC, NSW QSL officer and 28mc CW suprter, hopes that at last he has created a cord. He has QSO-ed a few G's at 8 am 28mc—Jim won't listen to any other claimts for the record.

2KAP, 2BZ and 2TY are organising a 168mc k in the Hunter Valley.

2DO's DX efforts on 40mx telephony are editable and W's are no problem.

When a W asks you do you recognise his ice it's a little difficult, but with XK2VN the mike from WOTQK, 2ADT was caught t.

2YL and 2ADT, of Cessnock, were anxious make the first VK contact on 11 metres—out 24 hours after the release of the band ey performed the feat.

The European station SWBC din on 40mx the morning, is increasing. Some of em are over 100kc's into our band.

2AHM's collection of 7 vee beams is to be ded to. A 8 wave Rhombic for Europe on mc is to be erected.

The 40mx night owls surely punish the her. The other Sunday morning at 3 am 7 way QSO was in progress; it looked like ntinuing for hours.

OP1AP, choice DX on 14075kc's is on most enings.

Old timer VK2RF has limited space for rials, but manages to QSO W stations with ly 16 feet of wire, and that's on 10mx.

March, 1947, will be long remembered by 2WH. Active since 1924, it is the first ne that he has used AC. 32 volts DC and tary converters can be forgotten. There e plenty of problems ahead converting the equipment.

ZM6AC in Samoa is a new one for the cific area, on in the evenings, close to 00kc's.

4GZ believes in complicated home-built reivers. After much experimenting, the esent line up is 954 first RF, 956 second , 954 mixer, 955HFO, 6K7 IF at 1600kc, H 25 mixer/HFO, 6K7 first IF, 6K7 second , 6K7 third IF, 6H6 detector noise limiter, J7 audio, 6J5 BFO, 6V6 to a 12-inch speaker. vertical half wave 53 feet high on 20 metres the antenna.

6MX

The Pacific area has provided the highhts on this band during the past months.

All 6mx DX records were broken on Janu y 25th when J9AAF in Okinawa contacted 6DVG on Wake Island and KH6DD in nolulu—a distance of over 4000 miles.

VK4HR in late February heard a KH in wail on CW The KH confirmed the reption.

In VK3 6mx has been quiet since mid-Janu y. About 35 stations are active around lbourne and VK3HZ at Warragul, in the ppsland area about 60 miles away, proing the DX.

The country hams' lot on 6mx is not always couraging, generally a lot of hard work for le results. 2PN, of Tumut, for instance, been as active as any other amateur on x. To date he has heard two interstate tions, 4RY and 4FB on separate occasions, no contacts. Midway between VK2 and 3 UHF centres both Melbourne and Sydney tions apparently skip Tumut.

HINTS ON GRINDING CRYSTALS

(Continued from Page 41)

but particularly near 7mc it will be enough to stop oscillation.

Using the finer powder, or some of the coarser stuff which has been finely ground, you must even out the high spot until the crystal oscillates once more.

If you find that an apparently flat crystal still won't oscillate, carefully bevel all around the edges to remove slight chips which nearly always appear. In most cases this will bring it back to activity. And in any case, bevelling nearly always improves the activity of any blank, finished or otherwise.

FINISHING

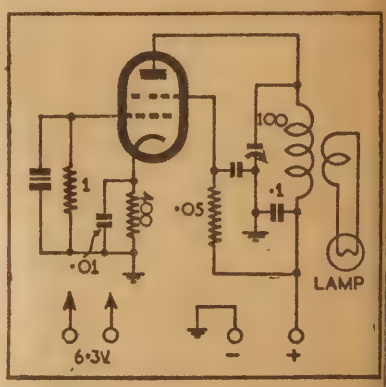
As you approach the required frequency, take much more care, as to lose activity now will mean that by the time you have corrected the fault you will probably have passed the mark. Remember, once ground too far, you can't retrace your steps. Only the finest, almost milky mixture should be used in the finishing process, in order to make uneven grinding almost impossible, and to give the surface a fine finish.

When you are within a fraction of your frequency, you must test the crystal in the actual holder to be used. The capacity between the plates will make an appreciable difference to the final frequency.

Edge grinding is necessary sometimes when a blank is too big for your holder. We have ground blanks down to about half their original size, without detrimental effects, and with only a small increase in frequency. Edge-grinding may also help if your blank proves a bit fractious, and will often assist in bringing up activity. But it should never be adopted as a means of correcting other faults, such as high and low spots. It should be considered more as a finishing process than anything else. And don't bevel or edge grind after you have reached your desired frequency. This process will slightly increase the frequency of the crystal, as we have already pointed out.

CLEANING

Carbon tetrachloride is useful for cleaning grease from crystals, but soap and warm water are best of all. Before mounting the finished blank in the holder, always wash it this way, or scrub lightly with a toothbrush, rinse well, and stand on edge to dry. Keep any suggestion of dirt or dust out of the holder.



The circuit of the test oscillator.

The blank may get dirty or greasy from your fingers while grinding. You may find that a wash is all it requires if it "goes out" and you can't think why. And watch the test crystal plates for grit when making checks. Cleanliness must be your golden rule all the time.

Finally, you must have complete patience, and the ability to take your time, if you are to succeed. Try to hurry matters, and you will run into trouble. Experience is the best teacher and after you have found your "feet" your overall speed will increase.

As a final word of advice, do not attempt to grind 7mc. crystals until you have tried yourself out with the 3.5mc. types. The thickness of the 7mc. blanks is only about 12 thousandths of an inch, and the beginner will find it rather difficult to keep them flat within the required limits. This is particularly so if the crystals are of the small area type. Generally speaking, the larger the area, the easier it is to grind, and beware of "rubbing down" 8mc crystals to hit the 50mc. band using the sixth harmonic. This is a real test of care and dexterity. If you can handle one of these successfully, you are either very lucky or have qualified as a competent crystal grinder!

ANSWERS TO CORRESPONDENTS

NDER THE PERSONAL SUPERVISION OF THE TECHNICAL EDITOR

J.F. (Box Hill, Vic.) sends in for com- t the circuit of a four-valve regenera- receiver and asks whether we have any e modern circuits to offer.

Sorry that we cannot supply a more lern circuit than the one in question, but so happens that we have no circuits along e exact lines in our files. The circuit erally should be capable of good results, ough we feel dubious about some of the stants. For example, the three 1.0 meg, stors in the plate circuit of the detector ld allow very little plate voltage and it likely that the values should read 0.1

The 25 megohm grid resistor is an- r dubious one. We can see no reason why ould not be the conventional 1.0 megohm. cathode bypass condenser for the 42 would either 10 mfd or 25 mfd. The condenser the loudspeaker output circuit is ap- ently intended to be in series with the ispeaker transformer, which is shunt fed. 8 mfd. electrolytic should serve in this tion. We doubt your suggestion that the hones should be in series with the audio te, since this would not save them from ying the full plate current of the 42 ut valve. More likely that they, like loudspeaker, should be shunt fed. In way, the audio choke carries the d-c e current, and the signal only is trans- ed to the phones or speaker through the es condenser.

F. (Leichhardt, NSW) was recently im- ssed by the quality from a small TRF iver and is tempted to change over his erhet to use the same detector system— de, transformer coupled to the output e.

We agree that the quality from a small receiver can be very pleasant indeed, ly because of the extended treble re- nse. However, their lack of reserve gain selectivity has largely accounted for r disappearance from the market as a mercial proposition. However, there is harm in trying out the same audio sys- in your superhet receiver, if you are keen experiment. The 57 can be connected a triode by tying plate, screen and sup- sor together at the socket. Thanks for r greetings.

M. (Ballarat, Vic.) says he has a 12in. hode ray tube on hand and would like know specifications and a circuit to il- trate its use.

We regret our inability to supply you with specifications you require and we have attempted to draw up a circuit to suit se tubes. If you are keen to study up general subjects of frequency modu- on and television we can only suggest that pay a visit to your nearest technical kseller and see what text books he has the subject. We will doubtless be pub- ing articles on the subject from time to e, but cannot indicate just when these nt appear, as so much depends on the ctuating interest from a practical point view.

A.G. (Armadale, Vic.) asks questions about ower transformer he has on hand.

The transformer is apparently an un- al type and it is not clear whether the ondary is centre-tapped or not. A centre- ped secondary would certainly be de- able to give the highest voltage output to simplify filtering. The 6X5-GT would the most suitable rectifier to use and you uld be able to get enough high tension tage from the combination to run a small eiver. Use a standard filter choke rated about 70 milliamps and with the lowest sible d-c resistance. The voltages marked the transformer would normally be RMS ues and the 240-volt primary would be with the power mains in your district. culations involving aerial coil gain, &c., very involved and you could not hope this means to calculate the output from r receiver.

R.D.L. (Lockleys, SA) asks why there are positive filament connections shown on 3S4 valve used in the Springtime Portable

There is no mistake in this diagram the 3S4 has three connections to the fila- nt allowing the two halves to be used ier in series or parallel as required by circuit. The Springtime Portable uses parallel connection, in which the filament rates at 1.4 volts, 0.1 amp.

R.F. (Horsham, Vic.) sends in an ad- tisement and says he liked the recent icles on short-wave receivers.

Thanks for your advertisement and we glad to note that you have appreciated articles. We trust that the ideas work well in your own receiver.

J. Danzie (Little Swamp, via Port Lincoln, SA) asks for the dimensions of Minimax batteries.

A. The number 467 Minimax (67½ volts) measures 3-45/64 by 2-13/16 by 1-3/8in. over all. The number 482 Minimax (45 volts) measures 5-½ by 3-19/32 by 1-27/32in. over all. Sorry, but we cannot help you in the matter of obtaining fabric covering for portable radio cabinets. However, we have reproduced your full name and address above so that any reader who may happen to know of a source of supply can write to you direct.

S.F.W. (Richmond, Vic.) has on hand some English valves from British Army equipment and would like to know their characteristics and the types of circuit in which they can be used.

A. It is far too big a job to keep track of the characteristics of the thousands of valve types in existence—military and otherwise—and enquiries of this nature should be addressed to one or other of the local valve manufacturers who could be expected to have a more or less complete record of types.

THE following reprints are available on application at our offices, 60-70 Elizabeth street, Sydney. They will be sent, post free, on receipt of stamps or postal notes.

How to Build a Synchronous Clock.
4 Pages 1/-

A Pendulum Type Electric Clock.
8 Pages 1/-

Build Your Own Windcharger.
8 Pages 1/-

Coil Details for Small Receivers.
1 Page 6d

Radio Circuit Symbols.
1 Page 6d

Collecting Verification Cards.
1 Page 6d

D.R. (Moorak, Tas.) sends in an advertisement and expresses his appreciation of the magazine.

A. Your advertisement has been attended to and we appreciate your encouraging remarks.

W.W. (Flemington, Vic.) asks a number of questions about a resistance capacity bridge.

A. It would take more time than we can spare at the moment to investigate the whole question thoroughly, but the following remarks may be helpful. The 6U5/6G5 is rated to operate with as low as 100 volts on the target so that it should be quite in order to use it in conjunction with two 67½-volt B batteries. The ac-dc supply apparently specified in the original circuit was probably the most convenient arrangement for American conditions. It is difficult to say whether the output from the buzzer would be sufficient to operate the indicator tube, but in any case you can probably step up voltage considerably with the aid of an audio transformer. We are glad to note that you have found so much of interest in "Radio & Hobbies."

R.L. (Five Dock, NSW)) reports having built up the "Little Jim 11" receiver, but says he can only receive seven of the local stations.

A. You are really not doing too badly with the set, as little jobs like this one are really not intended for more than local reception. However if you were to use a larger aerial and coupled it to the set through the recommended primary winding you would probably do better than the present arrangement. It will be surprising if the reaction functions normally with the aerial connected straight to grid.

R.J. (Tharwa, ACT) asks whether one needs headphones with a three-valve receiver.

A. One cannot give a definite answer to such a general question since the nature of the circuit rather than just the number of valves, determines whether or not the set is more suitable for use with loudspeaker or headphones. Broadly speaking a three-valve battery set would probably work a loudspeaker on all the stronger stations, but only earphones on the rest. A subscription to "Radio & Hobbies" will cost you 6/- per year, including postage.

T.J.R. (Burwood, Vic.) asks whether it is possible to use a 6U5/6G5 in a set other than as a tuning indicator.

A. The triode portion can be used as an ordinary triode amplifier and we have also heard of a couple of odd schemes for using these valves as detectors. However, they do not fit in very well into the scheme of an ordinary 5-valve set and there is not much point in considering their use other than as tuning indicators. Many thanks for your subscription to "Radio & Hobbies" and for the kind wishes.

J.M. (Sth. Preston, Vic.) is very interested in high quality reproduction and asks in particular about the Lexington pickup referred to recently.

A. The pickup which we had was a sample and we have no knowledge of any large shipment coming forward. However, quite a lot is doing in the realm of high quality pickups and it should not be long before several at least become available. We also are interested in the subject of vented enclosures and will probably be publishing an article within the next few issues.

A.C. (Gilgandra, NSW) is interested in the old "Pentagrid 46" circuit and suggests that it could well be re-designed for amateur or communications work.

A. We do not share your views on this set since, for one thing, it does not use an RF stage. This stage admittedly complicates switching and coil requirements, but adds greatly to the station-to-station performance of the set. Switching in the two extra audio valves improves the audio characteristics but would not add materially to the range of the set. A much more specialised approach to the design would be necessary.

HOW TO SUBMIT YOUR QUERY

1. Queries will be answered in rotation through the columns of our magazine if not accompanied by a fee for a postal reply.

2. Queries, neatly and concisely set out, will be answered by mail as quickly as possible if accompanied by 1/- in postal notes or postage stamps. Endorse envelope "Query."

3. Back numbers are rarely available but reprints of most circuits, wiring diagrams, and parts lists will be supplied for 6d each, minimum charge 1/-. Thus a circuit, layout, and parts list will cost 1/6 in stamps or a postal note. Endorse envelope "Circuit."

4. Blueprints of exact size chassis layouts with all essential holes and cut-outs will be supplied if available for 2/6. Endorse envelope "Blueprint."

Address your letters to the Technical Editor, "Radio & Hobbies," Box 2728C, GPO, Sydney.

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ANSWERS TO CORRESPONDENTS

?. (Footscray, Vic.) is very interested he "Fireside Five" receiver and asks her a 6G8-G could be used in place of 6B8-G.

The 6G8-G could be used in the original it without change to the constants. the 300-volt power transformer should atisfactory, although it would be a good to add a resistor of a couple of hundred s in series with the choke to prevent ndue rise in the high tension voltage. to note that you appreciate the les on designing a short-wave receiver.

R.D. (East Melbourne, Vic.) writes in eciation of "Radio & Hobbies," mention- in particular the query service through h he has obtained valuable assistance.

Many thanks for your letter which we with interest. Your subscription has been attended to.

K.B. (Armidale, NSW) sends in his sub- tion to "Radio & Hobbies."

Many thanks for your subscription and the encouraging remarks in regard to magazine. We have in mind to de- e a modulated oscillator in the near re, and this should meet with your re- t.

B. (Jeparit, Vic.) is very interested in dio & Hobbies," but would like to see space devoted to radio, particularly le sets and test equipment.

Many thanks for your letter, R.B., and various suggestions have been noted. are planning to cover the range of test pment as time permits.

G.P. (Angaston, SA) sends in his sub- tion to "Radio & Hobbies," and enquires t call sign books.

Just at the moment we know of no o-date call-sign book, other than the of- l booklet available from the PMG De- ment.

J.T. (Ulverston, Tas) sends in the circuit small receiver for the "Reader Built page.

Many thanks for your contribution, but so similar in principle to one which already been featured that we doubt ther reproduction of this circuit is anted. A 6-volt a-c supply cannot ate the receiver in place of an accumu- , since it would be unsatisfactory when ied to the plates and screens.

D. (Elwood, Vic.) asks why there is a ency to adopt lower voltage power trans- ers, rather than the alternative of re- ng the high voltage transformers and ting a choke input filter system.

The primary reason for changing the r supply design is the widespread adop- of permagnetic loudspeakers in place electro-dynamic types, which necessi- a high d-c resistance in the filter cir- The reduction in transformer voltage ly obviates difficulties with condenser kdown so that one serious objection condenser input filter immediately dis- ars. The filtering efficiency of a choke system is lower, so that it would be ssary to use either very much larger ensers or a second filter choke. Further- , the first filter choke has to be ruggedly ructed if it is not to suffer with lamin- hum. In the average receiver or ifier the condenser input system is by the simpler of the two.

H. (Toorak, Vic.) reports on excellent ts obtained from the "1941 Portable."

Many thanks for your letter and glad note that the portable is performing well.

H.V. (Oakbank, SA) writes in apprecia- of "Radio & Hobbies" and says that as read every issue since the first one in 1939.

Thanks for your letter, A.H.V. which we with considerable interest. Glad to that your portable is still going well. you certainly cannot expect better ice than you have obtained from the olt valves. Several quite lengthy articles "Loran" have appeared in overseas nals, but we have not had the space give the subject as much attention as have done.

O. (Kedron, Qld.) was in difficulty with lation trouble in a "Fireside Five" iver. After much tinkering with the he discovered that the sole cause of the ble was in the fact that had mounted aerial terminal in such a way that the beneath the chassis was hard against an plate lead. Shifting the aerial terminal better spot entirely removed the trouble.

Many thanks for your letter and we are sed to know that your set is now ving as it should. We have reprinted nint in case other readers run up against same trouble.

R.B.R. (Spokwood, Vic.) is interested in the "Fireside Five" receiver and asks about the various operating voltages.

A. In the normal way the voltage on the high tension line should be about 260 volts under average conditions, while the screen voltage could be set to 100 on the voltage divider and the oscillator anode voltage to anything from 150 to 200 volts. If these voltages are in order, everything else should look after itself quite automatically. To use the EL3-NG output valve in place of the 6V6-G it would be desirable to reduce the 150 ohm back bias resistor to about 75 ohms.

N.J. (Newmarket, Brisbane) refers us to an old English circuit which operates without separate high tension supply.

A. Thanks for the circuit and for the personal remarks. It is possible for simple circuits to operate with only the positive filament voltage applied to the plates, but their purpose is very limited under these conditions. The 1Q5-GT would probably be better than most valves under these conditions, but a lot of experimenting would be necessary with the coil to ensure operation of the reaction circuit.

W.M.E. (Lakemba, NSW) comments at length on the various features in "Radio & Hobbies."

A. Many thanks for your letter which we read with interest. We appreciate such expressions of opinion and they do help us frame the technical policy of our magazine. All the best for your future activities and trust that it will not be long before you join the amateur fraternity.

H.R.I. (Caulfield, Vic.) writes in deploring articles in overseas magazines which purport to show that only a limited number of listeners really appreciate high quality reproduction. He points out that his own experience has been to the contrary, many people exclaiming surprise at the quality of reproduction which he has obtained, even at times with equipment of quite ordinary pattern.

A. Despite your rather strong feelings in the matter we cannot help but feel that there is a very big element of truth in the listening tests. Add to this the undoubted fact that a very large proportion of listeners confine their attention to serials or treat radio music purely as a background to their activities, preferably with the treble eliminated to prevent resulting annoyance. Only those who deliberately sit down to listen to and enjoy a musical programme, be it classical or otherwise, are likely to be aware of the difference between true high fidelity reproduction and that which is just easy to listen to due to lack of obvious distortion. There is also a big difference in what people may notice under ordinary domestic listening conditions and under conditions when they are in a room for the express purpose of hearing a receiver or amplifier in operation. We are not decrying the desirability of high fidelity ance of receivers with very ordinary fidelity characteristics. Most design engineers appreciate high quality themselves but, after all, have to design the type of set which experience has shown to be a commercial success. On the other point we are sorry if our occasional references to the "proverbial junk-box" have irked you, but it is just one of those terms which seem to be accepted rather facetiously among enthusiasts, but the results do account for the predomin-

A.F. (Murrami, NSW) is interested in small sets and asks about the range of a crystal set and "Little Jim's Mate."

A. Glad to receive your letter and to note your interest in "Radio & Hobbies." Under the very best conditions, a crystal set might receive stations over distances of hundreds of miles, but such reception can only be regarded as freak and not a regular thing. Normally, it is rather futile counting on anything more than 25 miles and, even then, a good aerial and earth are essential. A small receiver like "Little Jim's Mate" can tune short-wave stations from anywhere in the world so that its range could be said to be unlimited. However, for consistently good headphone reception, 50 or 100 miles must be regarded as a normal maximum, and then with a good aerial and earth

A.D. (Sth. Brisbane) sends in his views in regard to television.

A. Many thanks for your letter which was read with interest. We have not yet decided whether we can do very much about it at the moment, but as you may guess, we have several things in view. Thanks for your best wishes and appreciative remarks.

WANTED TO BUY, SELL OR EXCHANGE

Readers wishing to buy, sell or exchange goods are invited to insert an advertisement on this page. The cost is 9d per line; minimum charge 2/3. Approximately 6 words to a line. Advertisements for the next issue must reach our office by WEDNESDAY, APRIL 9. Dealers' advertisements not accepted.

EXCHANGE for good crystal pick-up, or elec. motor and turntable with cash adjustment. 1 "H" 2-G., 1 large Efco "ship" dial; pair of Kingsley I.F. trans.; valves—EBF2/GT, 6A8, 6L6, 78, 6K7, EL3NG, 5Y3G—J. Fargie, 128 Riversdale Road, Hawthorne E2, Victoria.

EXCHANGE: Australian Official Radio Service Manual, Vol 2, 3 and 4, for a 1D8 and 1A7, or for sale, £2. A. Senwright, 6 Methuen Parade, Narwee, via Herne Bay.

FOR SALE: 3 valve radio; 0 to 1 M/A meter (calibrated Ohms, Volts, M/A, etc); 10 electrolytics; 6 S/H speakers; 1 electric motor with grindstone and mounting; 2 power transformers; 13, popular valves; 3 Neon globes; "B" plus eliminator; pair earphones; 10 potentiometers; 25 S/W's (Rotary & Toggle); Soldering iron; 60 copies R & H; large quantity resistors, condensers, nuts bolts, lugs, plugs, sockets, terminals, dial globes and holders, household S/SW, plugs etc., indicator bezels, name plates etc. Plus £8 worth mixed parts. £30 the lot, or prices on application. Write for full list to G. Atkinson, North Street, Albury, N.S.W.

FILMS FOR SALE: Kodak "Super XX" films, 52½ feet long by 5½ inches wide, in sealed metal cans. These films are approx. one year overdate, but being so well sealed are in particularly good condition. Ideally suited for amateurs who are prepared to cut their own. About thirty six 1-20 or 6-20 films can be cut from each reel. Price, £1 posted, or will accept radio parts in exchange. J. D. McLennan, 88 Northgate Street, Millswood, Adelaide.

FOR SALE: ½-plate portable folding camera, (with tripod), 3dz. Panatomic and XX ½ plates. Quantity enlarging and printing papers, tank, thermometer, glazing sheet, roller, trays, developers, hypo, sepia tablets etc. NB Camera is attachable to lamphouse for enlarging use. £10 the lot, or prices on application to G. Atkinson, North Street, Albury, NSW.

FOR SALE: A.T.R., S12. 100 watt inverter 12V-DC to 250V-AC (used twice). Palec VCT/V tester (condition as new). P.P. 2A3 amp with sep. preamp. (H. D. power supply). R & H. PP 1D4 batt. amp. (less batts. & speaker). Philips DC mains elim. Large assort. oddments cheap. Write for details, or send offers to McKenzie, Box 40, Dimboola, Vic.

FOR SALE: One Simplicity 10 watt. amplifier complete, one Crystal Pick-up, two Gramo motors, one turntable and fittings, etc. The lot, £5. Apply, "Occupier," "Brightholm," Nirrena, East, via Meeniyan, Sth. Gippsland, Vic.

FOR SALE: Ghirardis' mod. Radio Servicing and Trouble Shooters handbook, 30/- each, other technical books cheap. High gain Amplifier with Crystal Mike and 12in. per mag speaker, £20. T. Roberts, 17 Oriental Street, Bexley.

FOR SALE: Audio amplifier, 40 watts, 12in. Rola speakers, 4 speaker boxes, Crystal mike, 2 mike stands, pick-up, spare output tubes, cables, etc.,, all complete. What offers? A. Hick, 4 Ledger-road, Woodville, S.A. M7026.

FOR SALE: AT5, AR8 Aircraft Transmitter and receiver coupling unit, and Junction box. In perfect order, £30. Will exchange 1875 a side power transformer for same article 1000 a side. Box 186, Darwin.

FOR SALE: Valves, 10/- each, 6SN7, 6J7, 6F6, 6J5, 6SJ7, 6SR7, 6SQ7, VR150. Others at 5/- each., 6H6, 6AC7, 6SH7, etc. All good. Potter, 22 Laverton Street, Williamstown, Vic.

FOR SALE. 1 STC 2 gang cond. £1. New 1 dial—MK-17A. 4in. x 3½in 10/- New or exchange lot for 1 speaker suitable for 2 valve set wanted. R & H. July '42. Price to R. Gordon, 78 Gaffney Lane, Broken Hill.

FOR SALE: 1 valve set, complete with 'phones and new batteries, £4. Little Jim's Mate, £5. Will sell both minus 'phones, batteries. 141 Carlingford Road, Carlingford, NSW.

FOR SALE: Bargains in Valves: Number of 6AC7/1852's at 25/- each. 6H6's, 10/- each. 954 or 955 with socket, £1 each. 12SR7, 717A, 9002, 9003, all 15/- each. P. J. Mangan, 624 Stanley Street, Albury.

FOR SALE: Microphone, brand new "Torpedo," with enclosed transformer, £4/10/-. Pacific Radio Service, 59 Walker Street, North Sydney. XB7188.

FOR SALE: Calstan, mod. oscillator with new 1D8GT valve, also one Magnavox G-12 (type) speaker—best offer. R. B. Mackay, Harwood Road, Maclean.

FOR SALE: Genuine Bliley AX-2 Mounted Crystals, 7030.8, 7050.7, 7150.9, 7169.6, 7181.7, Kcs. £2/10/- each. A. J. Greenham, 131 Gladstone Road, Brisbane, S.1.

FOR SALE: Or will exchange for single barrel shotgun or South Bend reel. Simple Simon 2 Valve. Complete, less batteries. D. Waterhouse, Box 12, P.O., Woolgoolga.

FOR SALE: Valves, new, E.F.50, 15/- ea. 1 Cond., 400VW, 800VW Resistors. UJ5149. J. Cuming, 25 Claremont Road, Butwood, NSW.

FOR SALE: Wave meter, A.W.A. £8. Two No. 11 Power Supplies, £2 each, nine-pin EF50 Amphenol Sockets, 4/9 each. 23 Doomben Avenue, Eastwood.

SALE: Stromberg Carlson short-wave adapter as new. £4/10/-. R. Hall, 190 The Boulevarde, Punchbowl. Sat. mornings only.

FOR SALE: Two Valves, 1D8GT, brand new, for sale or exchange for 5in. speaker. 90 Asquith Street, Auburn, NSW.

FOR SALE: R & H.—60 copies 1941 to 1947, few missing, reasonable offer. J. E. Curl, Bay Road, Mount Gambier, SA.

FOR SALE: Or exchange, 25H chokes, 1 and 4, Mfd. Chanex Condensers, 2 Valve battery set. Dennis, Carlton House, Casino, N.S.W.

FOR SALE: Freq. meter. Monitor, A.W.A. 1.5 m/c to 10 m/c. Operates 6 volts A-C. £10. Box 10108, c/o R & H, Advt.

FOR SALE: Palec Valve and circuit tester in perfect condition, with instruction book. £15. 5 Napier Street, Lindfield.

FOR SALE: R & H. 39-47. Offer. Particulars. XU1262.

SALE: 3in. permag. spk., 17/6; Efco FD32 dial never used, 15/-; Single gang cond., 5/- each; Vernier BC or SW dials, 5/- each; RCS aerial and RF coils, 5/6 each; 2 gang trim. cond., 3/6; Audio and Mike Transf., 5/- each; Morse keys, 4/6; door bells, 4/6; 6 Popular Science for 7/6. Wanted, Jan., Mar., Apr. 1946 R & H. J. Tremain, Stanhope, Bourke Road, E. Kew, Vic.

SELL: New 4/5 portable, Minimax batt., £18. Exchange or sell. Valves (6SA7, 6SK7, 6AC7, 1K7 for 6J8, 6G8, 6V6GT, 80) or 14/- ea. 3 gang short w. cond. 24:1, Vernier for Strom H. 2 gang and dial or 22/-. Battery set kit (8in. bal. arm. spkr., tuning and reaction cond., dial, B/C and S/W Reinartz coils), for 5in. spkr. or 30/-. Hopkins, 174 Raglan Street, Mosman.

SELL: 12 1-8in. Electro Dynamic Amplion spkr., less trans. 7500 field, good order, also 6J8-G, 80, 1H4-G valves. Particulars R. Kefford, 22 Catherine St. Punchbowl, NSW.

SALE: 2 valve set, complete cabinet, batteries, earphones, £3/10/-. Also 5 valve mantel set, A.C., excellent condition, £11. A. G. Beaton, 213 Rose Street, Darlington, NSW

SELL: 65 Radio & Hobbies. 7-1939, 12-40, 8-41, 10-42, 9-43, 4-44, 11-45. Includes 40-41 Xmas issues. Complete or part quote offer. Williams, 35 Frederick Street, Campsie.

SELL: 4.8 volt electric motor, 12/-. 2 Morse code sets, 12/- each. 2 for £1. Crystal set, less 'phones. £1. New 4000 ohms headphones £2. Ron Jeffery, Tharwa, A.C.T.

SELL: 1 Elipsoid mike, plus stand, brand new, £4 or offer. F. Nelson, C/o. Railway Station, Condobolin.

SALE: Unused Nilson & Hornung "Practical Radio Communication," 1935. G. Jones, Box 1637M, GPO., Melbourne

WANTED: 1hp. AC elec. motor, single p 240 volt, good order, price, particu H. E. Grealy, Nimbin, via Lismore, NS

WANTED: R & H. Vol. 1, and Vol. 2. Vol. 3. No. 1, April '41, and Vo No. 6, Sept. '42. Holley, 78 Taylor St Bankstown, NSW.

WANTED: R & H. Vol. 1, Nos. 2 & 12; 2, Nos. 1 & 12; Vol 3, Nos. 1, 4 Vol. 5, Nos. 2 & 8. D. Duff, 8 Florrie St Granville, NSW.

WANTED: Copy of Wireless We Printed, 1937, containing Advance Cir using AK2 Valve. A. Morehouse, 9 Fred Street, St. Peters, NSW.

WANTED: 815 Valve or Valves. Particu price, etc., to E. Carruthers, 55 Ale dra Street, Hunters Hill. Phone: Hunter

WANTED: Weston Model 375 Galv meter. A. C. Gray, 111, The R Heidelberg, N22, Vic.

WANTED URGENTLY: "R & H" for 1946. State price in reply. R. H. Petersen Street, Wynnum, Brisbane.

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